VOL. 18. NO. 3 MARCH, 1920

THE METAL INDUSTRY

WITH WHICH ARE INCORPORATED
THE ALUMINUM WORLD: COPPER AND BRASS: THE BRASS FOUNDER AND FINISHER
ELECTRO-PLATERS REVIEW

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A MONTHLY JOURNAL RELATING TO THE METAL AND PLATING TRADES

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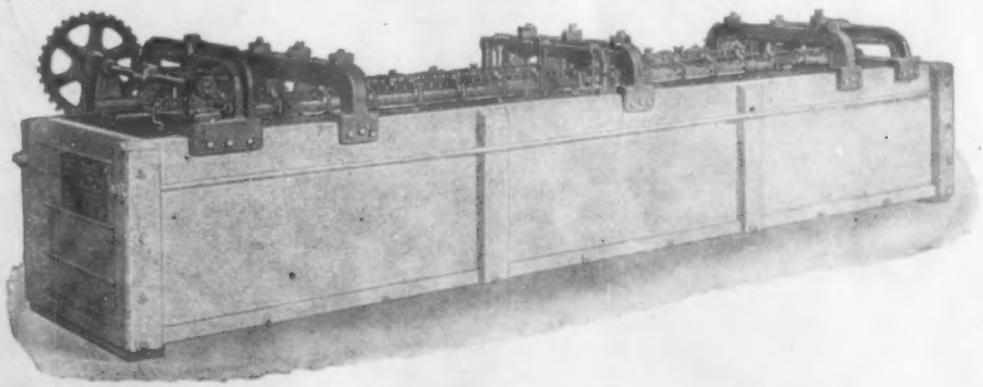

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THE METAL INDUSTRY
WITH WHICH ARE INCORPORATED
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ELECTRO-PLATERS REVIEW

Vol. 18 NEW YORK, MARCH, 1920 No. 3

The Manufacture of Brass Sheet and Coils

A Description of the Procedure Followed and the Steps Taken in the Rolling of Brass. The First Article of a Series on Rolling Mill Practice.

Written for The Metal Industry by ABRAHAM LINCOLN SCOTT, National Conduit and Cable Company, Hastings-on-Hudson, N. Y., Jun. Member A. S. M. E.

ABRAHAM LINCOLN SCOTT.

In ordering sheet brass, the customer should always specify the use to which the metal is going to be put, as this is an important factor in determining the alloy necessary to give complete satisfaction. In many cases mills fail to suit their customers simply because they do not know their requirements. Brass may be excellent for one purpose but it is possible that it may be entirely unsatisfactory for another class or a different sort of work.

Common brass, as the term is commercially used, applies to a mixture of from 60 per cent to 70 per cent copper and the balance zinc, percentage of copper varying according to the class of work for which the metal is to be used. Of course, it is very seldom that all virgin metal is used; as high as 50 per cent scrap is utilized depending entirely upon the type of scrap and the class of metal desired.

When correct box moulds are used it is not necessary to anneal the metal before the breaking-down process, except in the case of leaded stock when it is advisable to give the metal a heavy annealing before attempting to roll. However, in some mills the old match moulds are still in existence and in such cases when the slabs are not filed immediately and correctly, the burs on the metal are liable to cause considerable trouble in the rolling operation as they have a tendency to crack along the edges. In order to eliminate this defect, it becomes essential to anneal this metal upon its arrival in the rolling mill.

The metal is cast by the casting shop into the various alloys and widths according to the size and mixture desired. It is received by the sheet mill in the form of a slab. Each different size bar is of a uniform, average weight which only varies a few pounds one way or the other. These slabs are belly-shaped; that is, one side is flat while the other is a convex surface, the center of the bar being approximately one-eighth of an inch thicker than the sides. This curvature enables the roller to maintain a more uniform gauge in taking off the maximum reduction. This convex surface is also essential to stop the edges from curling and even in the finest sheet the rolls are ground so that the metal will be slightly thicker in the centre than on the edges. Although this difference cannot be detected with the naked eye, it is easily found by means of a micrometer. The following are the dimensions and weights of the various standard sized bars as received by the sheet mill:

Size of Bar.	Length.	Minimum Thickness.	Maximum Thickness.	Weight.
4″	5′ 10″	1″	1⅛″	81 lbs.
4½″	5′ 1″	1″	1⅛″	81 "
5″	4′ 7″	1″	1⅛″	84 "
5½″	4′ 3″	1″	1⅛″	80 "
6″	3′ 8″	1″	1⅛″	79 "
7″	3′ 2″	1″	1⅛″	80 "
8″	5′ 6″	1″	1⅛″	79 "
9″	3′ 4″	1 1/16″	1 3/16″	81 "
10″	4′ 3″	1″	1⅛″	83 "
12″	3′ 6″	1″	1⅛″	81 "
14″	3′ ..	1″	1⅛″	75 "

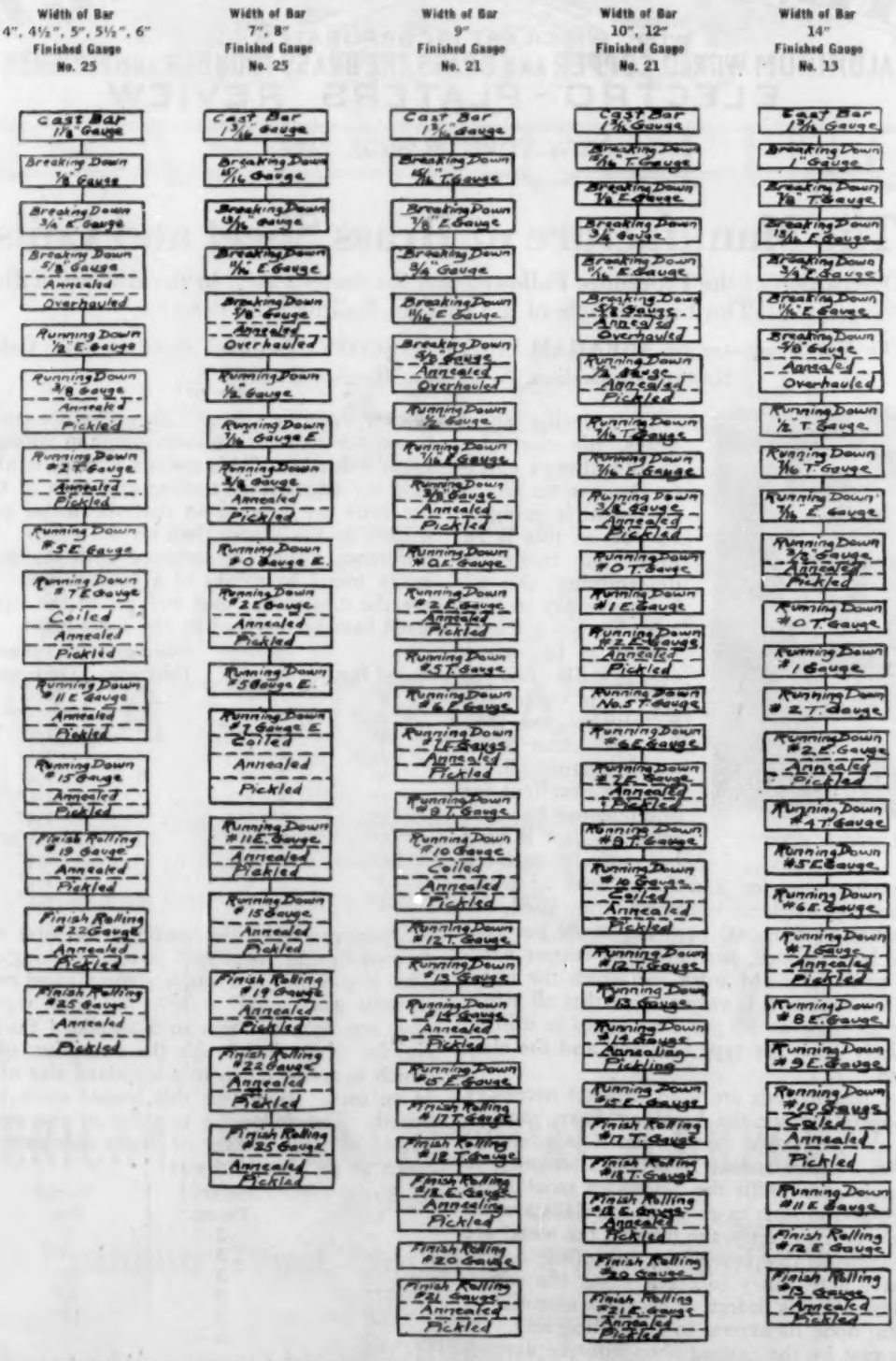
Upon receiving the castings the first operation performed by the sheet mill is the breaking-down process. This is a rolling operation accomplished on a heavy pair of rolls usually 20″ x 36″. All bars, regardless of the size, are broken down to a standard thickness of five-eighths of an inch, with the exception of leaded stock which is rolled down to a standard size of three-fourths of an inch. However, this leaded stock is seldom produced. The following is a list of the various bars together with the number of passes necessary to bring them down to the standard size:

Size of Bar.	Number of Passes.	Size of Bar.	Number of Passes.
4″	3	8″	4
4½″	3	9″	5
5″	3	10″	5
5½″	3	12″	5
6″	3	14″	6
7″	4		

On extra thick cast bars or metal containing nickel or a high percentage of copper, extra heavy pinches should always be taken on the breaking-down rolls and the metal thoroughly worked so that it will not fire crack in the first annealing operation. When it becomes necessary to widen the metal, it is rolled diagonally or cornerwise and in this manner an increased width from 1/2″

PRODUCTION ROUTINE

FOLLOWED IN THE MANUFACTURE OF SOFT BRASS SHEET METAL



THESE REDUCTIONS MAY BE VARIED SLIGHTLY ONE WAY OR THE OTHER ACCORDING TO THE CONDITION OF THE ROLLS AND THE TEMPER OF THE METAL. WHEN HALF HARD SHEETS ARE REQUIRED, ROLL THE LAST TWO NUMBERS HARD—IN THE CASE OF HARD METAL, ROLL THE FOUR LAST NUMBERS HARD.

to 1-1/2" is easily obtained. When it is desired to widen the metal more than this, the bars are cross-rolled so that the width increases rather than the length. Great caution should be taken, however, when the metal is being widened and it is good mill practice to avoid this operation whenever possible. It should be conducted by only an experienced operator as the inserting of the metal in the rolls is a very important factor; it is advisable always to enter the right corner of the slab about one-half inch ahead of the other corner. In this way a better grip is assured and the metal is received from the rolls more easily. Precaution should also be taken that a minimum amount of grease and oil is used in this operation, thus eliminating any unnecessary skidding.

After the breaking-down operation the metal is placed in the furnace and annealed, thus softening the brass so that the maximum reduction in thickness may be obtained in the next rolling operation. The roller should always study his metal and know exactly when to anneal it so that there is no danger of it cracking or breaking in the rolls. Too much importance cannot be attached to the operating as it is quite possible to spoil a whole batch of metal simply by leaving it in the furnace a few minutes overtime or by having the furnace a few degrees too hot. It is advisable always to have a pyrometer on every furnace so that the heat can be easily regulated.

When the metal has reached a red heat of the right temperature, it should be allowed to soak for ten or twenty minutes so that the whole mass will receive a thorough annealing. When coils are being annealed, it is good policy always to loosen them up before putting them in the furnace so that the heat will reach them more uniformly. The modern annealing furnace has two doors, one on each end and the annealing pans are so arranged that the metal to be annealed enters the muffle at the same time that the other pans are being extracted. When the metal comes from the furnace, it is artifically cooled by means of a slow, uniform spray of water. Care should be taken, however, that the metal is not chilled too suddenly or with a fast gush of water as the metal has a tendency to crack if it is not treated correctly. When leaded stock is being produced it should be allowed to cool off itself as it is very apt to crack if artifically cooled; these cracks are generally known as water cracks. If the brass is to be finished soft it is advisable to allow the metal to cool off automatically and it is good policy to keep water away from it entirely.

After the slabs are cooled they are sent to the overhauling machines where a thin layer of metal is scalped from the surface, usually from four per cent to five per cent, thus removing all grit and scale so that a fine surface may be obtained free from all scratches and blemishes. It is important that the overhauling machines be adjusted accurately so that a smooth, uniform cut can be taken from the metal and thus avoid making any unnecessary scrap. In some mills throughout the country, the metal is still overhauled hard, that is, before it is annealed, but this is very poor mill practice as the metal does not acquire a smooth finish in the majority of cases, it finishes with a speckled or streaky surface.

The bars are then transferred to the running down rolls where they are rolled down to a size within two or three gauge numbers of the finished size desired. During the rolling operations, the bar elongates without materially altering the width. As previously stated, in such cases where extraordinary widths are required, the bars are either cornered or cross rolled so that the reverse condition occurs, the width increasing rather than the length. The metal is annealed and pickled once approximately every three or four passes and cut to length at a point depending entirely upon the length required.

During the process of annealing the metal becomes coated with a scale of oxide due to its uniting with the oxygen from the air. It is absolutely necessary to remove this scale after every annealing operation and in order to accomplish this, the metal is pickled in a vat containinging approximately 90 per cent water and 10 per cent sulphuric acid, and in some cases it is desirable to add bichromate of soda to the pickle solution. The metal is allowed to remain in the tubs until the scale of oxide is completely dissolved by the acid, the length of time depending entirely upon the amount of scale present and the strength of the pickle solution used. Some sheets require only four or five minutes' immersion while it is necessary to leave other metal in a half hour and more. However, for the average run of metal, fifteen or twenty minutes will be found sufficient. The pickle tubs should always be lined with lead so that the acid will not readily attack or penetrate them. After withdrawing the metal from the tubs, it should be thoroughly rinsed in pure water, and it is preferable when possible, to spray the metal with a hose, thus washing off all of the sulphuric acid so that the rolls will not become pitted or the metal injured in the following rolling operations.

From the running down rolls, the metal is then sent to the finishing rolls where it is rolled to a finished gauge after which it is then ready to be slitted or sheared to the specified length and width. If it is desired to have the metal finished soft, an extra anneal is necessary prior to the sheets' entering the pickle solution. After being cut to the desired dimensions, the sheets or coils are then carefully inspected and packed ready for shipment.

ECONOMY IN THE MELTING ROOM

Previous to coming to America, I worked in Birmingham, England, for Mr. B. W. Goode, St. Paul Square, who manufactured all grades of sheet metal both in brass bronze and German silver; also in wire. I was his foreman melter or caster and was therefore responsible for all metal cast in the place. All I was allowed for loss in melting was two pounds per hundred weight (112 lbs.) and in some kinds of brass, it was little enough. In high brass, for instance, the loss is very heavy, but of course the dipping metal and bronze made up in a great measure and used to help me keep within my loss allowance. Still I had to watch every little point where there was likely to be a loss to prevent it.

I had twelve furnaces and divided them into two sets of six each with four men to each set; one man to pour the metal when ready. He would be in charge and responsible for all metal he turned out. He would have two furnace men and one ingot man; one furnace man to remain at the furnaces all the time with him and the other to cut off gates and file the strips and fill in his time at the furnaces; the ingot man's duty was to have the ingots up and ready when the metal was ready to pour.

I had another man to look after the skimmings and sweepings of the shop. He would wash and pick out the large pieces, the small he would pound up and wash again, then I could use a little of it in each melt.

I used to have the ashes cleaned out each morning, sifted and picked over. If any pieces of metal were found, it was picked out and thrown in a heap by itself; the small stuff that sifted through was washed and divided and I made settlers with it in my old crucibles.

I would charge the old crucible with the dirt; one good fire would reduce it. In the morning I would find a settler of about four or five pounds weight. So by close application I was enabled to keep within my allowance of two pounds per 112 lbs.—MELTER.

Electric Furnace Progress

The Rapid Increase in the Use of Electric Furnaces for Melting and Heating Metals. A Continuation of the Report in our February Issue.

In the February issue of THE METAL INDUSTRY we published a list of electric furnaces ordered or in actual operation on metals outside of iron and steel. Since then a large number of additional furnaces have been sold. The following table give those placed up to about March 1.

BAILY ELECTRIC FURNACES.

Kennedy Valve Company, Elmira, N. Y., 1 furnace, 105 K. W., 8 tons.

Atcheson Manufacturing Company, Rankin, Pa., 1 furnace, 105 K. W., 8 tons.

Utica Valve and Fixture Company, Utica, N. Y., 1 furnace, 105 K. W., 8 tons.

U. S. Copper Products Company, Cleveland, Ohio, 1 furnace, 105 K. W., 8 tons.

AJAX-WYATT FURNACE.

Chase Metal Works, Waterbury, Conn., 30 furnaces.

Waclark Wire Company, Elizabeth, N. J., 1 furnace.

Scovill Manufacturing Company, Waterbury, Conn., 1 furnace.

Standard Underground Cable Company, Pittsburgh, Pa., 2 furnaces.

Parish-Poole Company, Cleveland, Ohio, 1 furnace.

SNYDER FURNACES.

Haynes-Stellite Company, Kokomo, Ind., 3 single phase, 600 pound furnaces of 100 K. W. for Stellite.

Monel Metal Products Corporation, Bayonne, N. J., 1 single phase, 600 pounds, 400 K. W., for Monel metal.

H. Lifschitz, brass foundry and machine shop, Indianapolis, Ind., 1 furnace. In addition two Snyder furnaces have been placed for making alloy tool steels.

DETROIT ROCKING FURNACE.

General Aluminum and Brass Manufacturing Company, Detroit, Mich., 1 furnace, 2,000 pounds.

OTHER FURNACES.

One Ludlum Electric Furnace has been installed at the Andes Electrical Corporation, Coney Island, New York City, for smelting tin.

The Booth Electric Furnace Company, formerly the Booth-Hall Company, Chicago, Illinois, have installed 22 furnaces for melting brass. Details of the installations will be published at a later date.

This makes a total of 285 furnaces working or ordered for non-ferrous metals.

REASONS FOR EXPANSION.

Some of the reasons for the sudden and growing popularity of electric furnaces have been given by W. J. Pettis, a brass caster of many years experience, in an interesting article* a part of which is as follows:—

"A superintendent looking for information went on with a crew just starting their day's work. The pots were struck first, then the loose scrap was charged by shoveling into an iron funnel, that led to the crucible. He found the tendency of the fireman was to overload the crucible, a very natural one, as it meant opening the furnace door and handling the heavy funnel less often for the greater part of his 200 lb. charge which he could put in his pot at one time, the fewer times he had to charge.

"The result was that when the funnel was removed some small pieces fell over the side into the fire, and were melted, and ran down into the ash pit, and as each crew averages about fifty pots per day, and it does not take a very large piece of brass to make a pound, the loss in this initial operation was worthy of attention. When the light scrap went down then, perhaps a 'cabbage' was stuck in the pot. Then on the edge of the pot, supported by the brick walls of the fire, two to four pigs of copper were set to preheat and when the scrap went down the pigs were tonged into the pot. Each fireman runs five fires and it is not unusual for some of these pigs to heat up faster than the fireman gets them stuck and thus melt off a corner. This is added to the metal already in ash pit. Now it would seem that most of the troubles were overcome, but they have only begun.

"After pigs are melted down the salt is added and pots are charcoaled and when brought up to a proper heat are speltered. Out of a set of ten fires some are too hot to take the zinc properly and this calls for the addition of a piece of heavy scrap called a 'cooler' and increases the amount of metal in the pot to a point that requires very careful handling in order not to spill any of the contents.

"Occasionally some of the metal is lost by careless speltering, thrusting a large piece of spelter very rapidly into the hot metal and causing it to blow over edge of pot. While this form of loss occurs less frequently than the former one, still it adds its mite to the general loss. After the pots are speltered and the tongs put on the pot, the fireman's hooks on to a crane rope and the crane man pulls from the fire and swings over to skimming pile for the caster to skim. Several things can happen during this operation and generally do.

"If the pot is tonged, crooked or the rope pulls it out of the fire with a 'jerky pull,' a little bit more is added to swell the total lost.

"Now the pot is on the floor and the caster skims off the protecting covering of charcoal. The amount of metal that goes into the skimming pile depends largely on the caster, and the heat of the metal, but at the best some more is added to the general loss, except that this is not in the ash pit.

"Now the pot is swung over the molds and poured—and here some more metal is lost—the skulls left in strainers—and accidental spills on the floor or in the mold pit. The crucible, after running ten to thirty heats, as the quality of the crucible and the treatment it has received may dictate, is thrown out with from ½ to 5 pounds of metal stuck to walls or a small button in the bottom of the pot. Some firms sell the old crucibles with the brass in them, at a price they hope will make up the loss. Others have men clean out the pots and run the scraping through the regular reclaiming process.

"In either case it is a loss.

"There are highly skilled casters and crews who reduce all these losses to a minimum but they are the ex-

*The Waste in the Rolling Mill Casting Shop, by W. J. Pettis, advisory engineer of the Electric Furnace Company, Alliance, Ohio, from the Electric Furnace, February, 1920.

ception and even the most skilled caster is largely dependent on the skill of his helpers.

"The unrecoverable losses would be first, the zinc loss. A chemist for one of the largest eastern mills puts this at 6 per cent net, and 2 per cent gross. This is a mill running alloys carrying from 40 to 10 per cent zinc contents in their mixture.

"The writer has run test pots to determine shrinkage. On a 230 lb. charge of a 2 and 1 alloy, there was a loss of 4.33 lbs. by weight. The skimmings, skulls and metal that stuck to the walls of the crucible were all recovered and carefully weighed. Great care was taken in charging the crucible and in speltering; and a new crucible was used for each test. This showed a gross loss of approximately 1.8 per cent and assuming the copper loss was negligible and the zinc contents at 76 lbs., the actual zinc loss was 5.7 per cent.

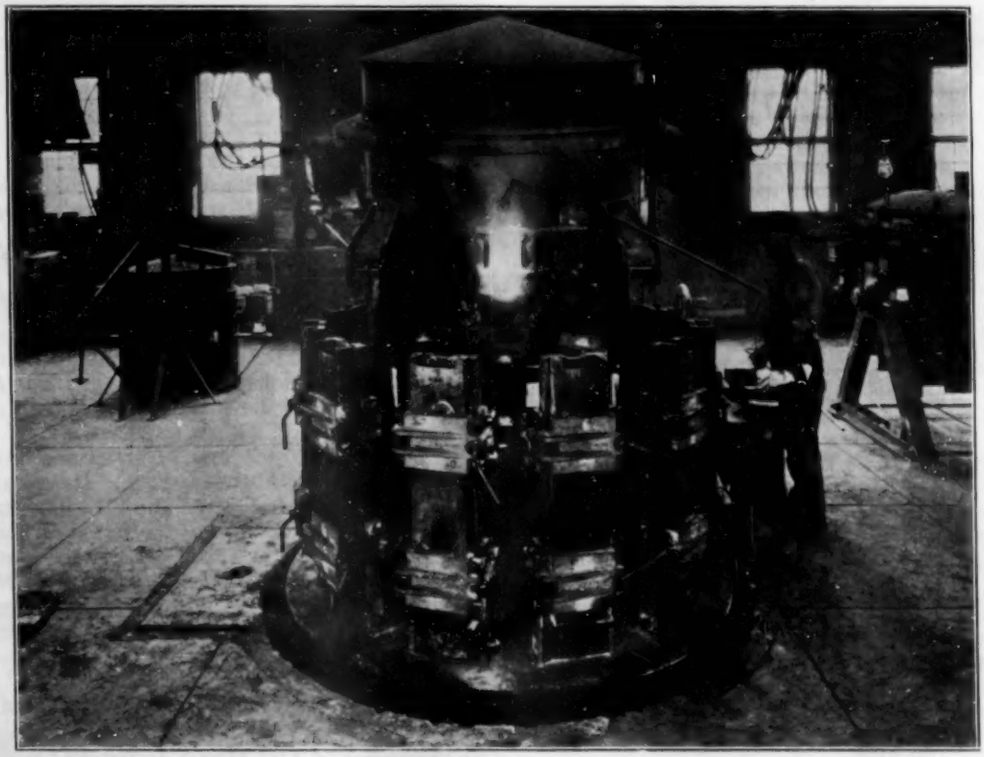
"The balance of unrecoverable loss occurs at the reclaiming plant.

"All ashes from fire pits, sweepings, etc., are put through some form of 'crusher' and the 'metallic shot' and small lumps of metal are recovered and go back to the casting shop in the form of 'washings' and are either melted, cast into bars and then cut up and used as scrap, or small portions of the washings are added to each charge direct.

"The balance of material from the 'crusher" operation carries minute particles of metal and oxides mixed with a large part of the first is recovered. This is shipped to a refiner—the copper contents running from 7 to 19 per cent. The refiner returns to the shipper the copper recovered minus the amount retained to cover refining costs. The zinc contents are not recovered. The rejected material from the table operation carries from ½ per cent up, of copper. The zinc is not determined.

"All this puts a heavy burden on one of the biggest industries in this country.

"A Western rolling mill as shown by inventory, finds a loss of 3 to 3½ per cent from book weight of metal delivered to casting shop. This they charge to zinc loss, scale in annealing, pickling, and in 'movement' of metal from casting shop to shipping room and feel that the zinc loss in the casting shop is reduced to a minimum, but about 50 per cent of the metal melted in their shop is pure copper or copper nickel alloys, where the loss is negligible. This report does not show the true zinc loss, neither does it show the cost of remelting the spilled and blown metal."



A ROLLING MILL UNIT POURING THE METAL DIRECTLY INTO THE MOLDS.

THREADS FOR AUTOMOBILE SCREWS

Question: Can you furnish our firm the standard diameters and pitches of the threads adopted and used by the Association of Licensed Automobile Manufacturers? We have received a contract for brass parts for automobile accessories and drawings, calling for A. L. A. M. thread.

Answer: For all diameters above 1 inch the pitch is 12 threads per inch. In the A. L. A. M. thread the U. S. S. form is retained in all sizes, but the pitch is finer, making the helical angle less. This makes a stronger thread and causes the parts to hold better. The A. L. A. M. thread differs from the U. S. S. in the pitch or number of threads to the inch only. The following is the standard adopted by all automobile manufacturers:

¼"—28	⅝"—18
5/16"—24	11/16"—16
⅜"—24	¾"—16
7/16—20	⅞"—14
½"—20	1"—14
9/16—18	

P. W. B.

The Still Process for Casting Aluminum Bronze

A Complete Description of a New Method for Preventing the Formation of Alumina in Aluminum Bronze

Written for The Metal Industry by P. H. G. DURVILLE, Metallurgist, Paris, France

The way in which this article by Mr. Durville has come to us is so unusual, and the circumstances surrounding the whole matter (such as his silence for several years being caused by his imprisonment in Germany), are so remarkable that the whole ground is gone over in detail. The first item is an editorial in THE METAL INDUSTRY of December, 1911, which read, in part as follows:

"There is no doubt but what some of the alloys of copper and aluminum, notably the five and ten per cent bronze, have very many commendable qualities which recommend their use in commercial products. Some fifteen years ago thousands of dollars were sunk by a foundry in New England to manufacture and exploit aluminum bronze. THE METAL INDUSTRY has from time to time published numerous articles describing the manufacture of the aluminum bronzes in many phases. After a long period of experimenting it has always been discovered that there was a weak point in the armor of the bronze. This was found to originate in the initial preparation of the alloy and it was finally decided that the cause of the trouble was oxide of aluminum formed when the metals copper and aluminum were melted and mixed together. To mention the different expedients used to overcome this formation of oxide would be to give a list of all the known deoxidizing agents known to metallurgists. We believe that nothing has yet been discovered that will effectually reduce the aluminum oxide and it is extremely difficult to prevent the initial formation of the oxide. We may be able to prevent it in a limited degree, but not in ordinary commercial foundry practice.

Among the notices of current patents in this issue of THE METAL INDUSTRY will be noted one granted to P. H. G. Durville, Paris, France. This patent covers the use of manganese as a deoxidizer in the manufacture of aluminum bronze. This does not strike us as being anything new for we are acquainted with attempts to use this material in the form of manganese copper for this purpose some ten years ago. The results of the experiments in question were not satisfactory for reasons which will be explained. Manganese does act as a deoxidizer under certain conditions, but it was our experience that the aluminum got ahead of it and oxide of aluminum was always formed first and the mischief was done. The reason is simple; aluminum is in itself an excellent deoxidizer and therein lies the reason for the failure to produce good and sound aluminum bronze in cmmercial quantities with minimum loss and of uniform homogenous composition. When it is realized with what difficulty aluminum is induced to give up its oxygen; when we study the details of Hall's process for the production of aluminum from bauxite and other aluminum bearing ores we can readily see how futile it is to attempt to reduce aluminum oxide to metallic aluminum in a crucible of molten metal by the simple addition of some substance known to have a certain affinity for ogygen. Our added substance may be an excellent deoxidizer for some metal, like copper, but in the case of aluminum only acts in a very limited extent and generally not at all."

This drew from Mr. Durville, a response, dated January 5, 1912, part of which ran as follows:

"You were kind enough to send me the December number of your journal containing on page 520 an extract of my American Patent No. 1,007,548 concerning alloys of aluminum bronze. On page 516 of the same publication there is an editorial article on this interesting subject of alloys of aluminum bronze, which is entirely erroneous as far as my patent is concerned. The editorial article in question draws attention to the delays which have occurred in the development of these alloys owing to the difficulties encountered in their preparation and the seeming impossibility of getting rid of aluminum oxides spontaneously produced in these alloys. It would appear from your editorial that nothing has been discovered up to the present to enable this oxide of aluminum to be eliminated. This is an error on your part for I have a process which enables me to attain this end, but which I desire to keep secret for the present.

"This, however, has nothing whatever to do with my patent No. 1,007,548, and your editorial is entirely in the wrong in connecting this patent in any way whatsoever with the employment of manganese for the purpose of eliminating oxides. On the contrary it is distinctly stated in the patent, and in the extract of it which you publish in the December number of your journal that the action due to the employment of manganese is destined to get rid of certain disturbing elements other than oxides. P. H. G. DURVILLE.

To this we replied in the issue of February, 1912, as follows:

"The writer of the article objected to by Mr. Durville merely remarked that the use of manganese was not new to him and he implied a doubt as to the beneficial results in the use of same. It was the writer's experience some ten or more years ago, while engaged in the manufacture of non-ferrous alloys, that the addition of manganese produced no effect which rendered the resulting alloy of copper and aluminum valuable in a commercial sense as a workable alloy. The object at that time was to produce aluminum bronzes for rolling, spinning, turning and other mechanical operations, but the project was finally given up, not because of the inability to produce them, but to do so commercially in large amounts.

In other words, the loss in scrap and shrinkage was too great to carry on the business. It was also stated in the article that as far as we know nothing had been discovered for the reduction of the oxide of aluminum, and this is so to the extent of our present knowledge. If Mr. Durville has discovered such a project we feel sure that it will work a revolution in the trades that employ aluminum as a constituent of the alloys produced, and we should be very proud to be among the first to chronicle such a discovery."

Early in February, 1920, we received this letter from Mr. Durville:

To the Editor of THE METAL INDUSTRY:

In the February edition 1912 of THE METAL INDUSTRY page 86, you were kind enough to write on the subject of "The Elimination of Alumina in Aluminium Bronzes."

"In other words the loss in scrap and shrinkage was too great to carry on the business. It was also stated in the article that as far as we knew, nothing had been discovered for the reduction of the oxide, of aluminum and this is so to the extent of our present knowledge. If Mr. Durville has discovered such a process we feel sure that it will work a revolution in the trades that employ aluminum as a constituent of the alloys produced, and we should be very proud to be among the first to chronicle such a discovery."

Now I have just read in the last December number of your journal, a leading article written by an engineer

who has seen in France applications of the process that I discovered for the production of ingots and plates without defects in all alloys, and most especially aluminum bronzes free from alumina.*

It so happens the wish expressed in your February, 1912, number has been granted.

To complete the information given to your readers I should esteem it a great favour if you would kindly mention informing them through your valuable paper that the process in question is covered by the American Patent No. 1,189,548 and also by many foreign patents including Germany.

Hindered in my business by the recent war, disabled for life by wounds and having passed many long months as prisoner in Germany, I have not been able to give you the details you wanted concerning my patent, now known as the Still Process.

On account of the difficulty in obtaining skilled labour this will probably interest your readers.

I am sending you a description notice on this subject and two drawings which I authorize you to publish with the notification of the patent.

Thanking you in anticipation, gentlemen,

I beg to remain yours very truly,

P. H. G. DURVILLE.

*Further Progress in Ingot Production, by Charles Meigh, THE METAL INDUSTRY, December, 1919.

This completes our story. From now on we let Mr. Durville speak for himself.—Ed.

THE STILL PROCESS

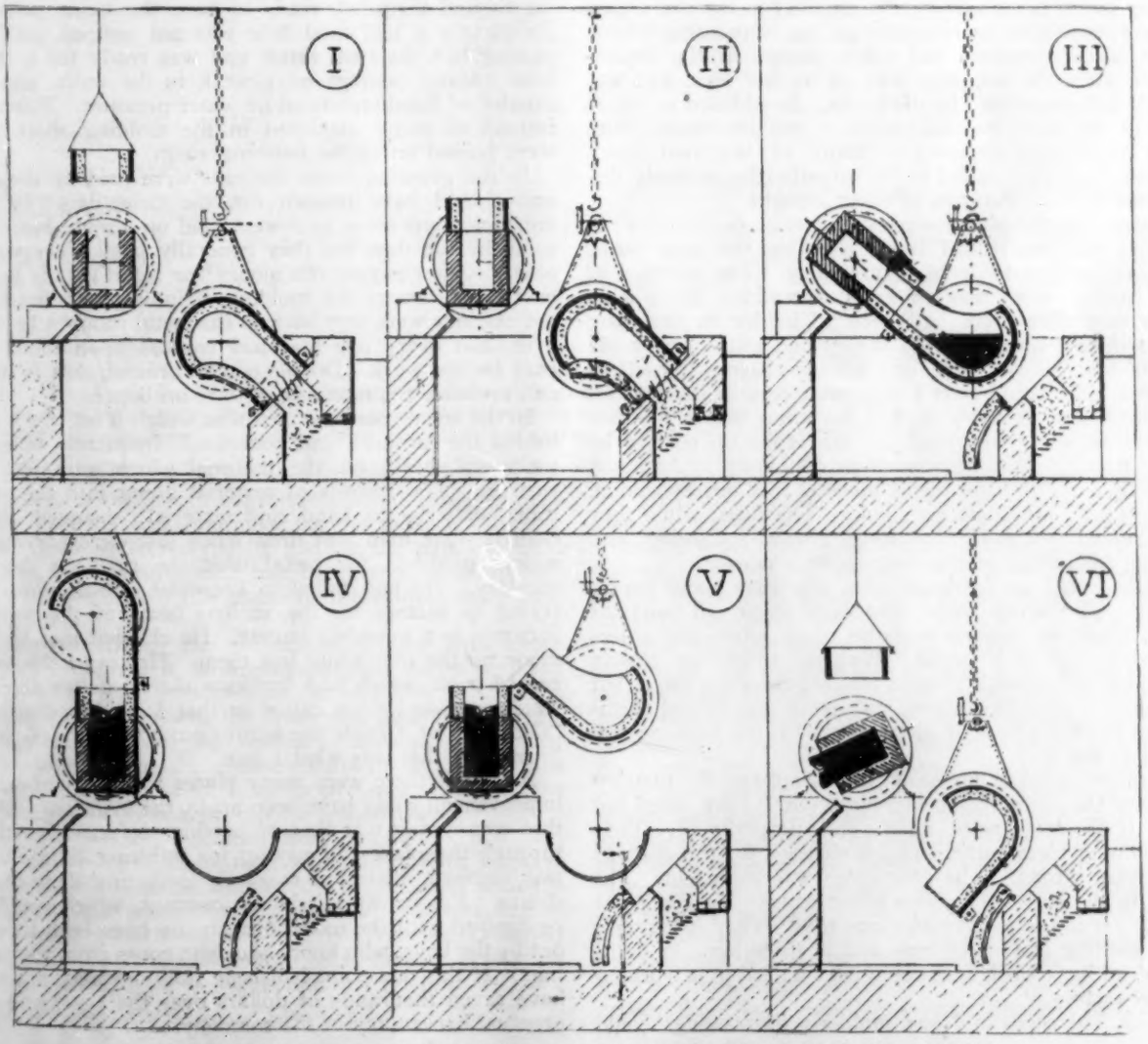
The equipment is composed of a fixed bed carrying two brackets for supporting a hinged shaft of equitable diameter to take the required weights. This shaft may be controlled latitudinally by the help of a horizontal hydraulic cylinder and radially on its own axis by a gear worked hydraulically or electrically. Each ingot casting equipment is fixed at the end of two permanent rails for bringing up the trollies, one from the demoulding area and one from the principal cupola or furnace line.

In Fig. 1 the stand holds the ingot mould, and the pot is being heated.

In Fig. 2 the ingot mould has the head attached in such a manner that the hinge-piece comes directly into line with the general assembling hinge on the pivotal shaft..

In Fig. 3 the ladle coming from the cupolas, with a charge corresponding with the mould capacity, (the charge having been mixed and the dross extracted) is placed in an exactly similar position in the opposite side of the pivotal shaft, which is then enforced by the horizontal control mentioned above , completing the hinge which forms the joint between mould and ladle, both of which are now carried on the stand brackets.

The ingot mould is mechanically brought into lineal



APPLICATION OF THE STILL PROCESS. AUTOMATIC POURING OF BARS FOR ROLLING.

position with the ladle by pivoting on the common axis, the mould and ladle being then locked in line by a suitable attachment. The flanges at the point of contact are plastered with fire clay to insure a perfect joint.

In Fig. 4 the metal is being run into the mould by tilting on the common axis; this movement is obtained by any simple mechanical method. The speed at which the tilting is done may be regulated mathematically, and a perfectly regular flow can be obtained without difficulty.

In Fig. 5 the attachment locking the mould and ladle in line, is now unfastened and ladle allowed to fall into position on the trolley, like Fig. 3.

In Fig. 6 the ladle is separated and the ingot is demoulded. The ladle is liberated, and taken on its trolley to its refilling point. On the way to the cupola the ladle is emptied of scrap, and if necessary preheated before the new charge is run.

The time taken to run an ingot when the Still Process is employed is less than that taken when run direct. To obtain perfection by this method it is simply a question of good management and organization, in which skilled labor does not enter.

THE IMPORTANCE OF INSPECTING CASTINGS

DIFFICULTIES CAUSED BY LAXITY IN THE INSPECTION DEPARTMENT.

WRITTEN FOR THE METAL INDUSTRY BY A COST ACCOUNTANT.

A great many manufacturers of brass and other castings are very careless in the matter of inspecting castings when they come from the molds, and before they have gone partly through the plant. There is no one point in the plant where carelessness can wreck the profits of a manufacturing concern quite as much as in the molding room. However, many manufacturers follow a penny wise and pound foolish plan of operation.

A few years ago the writer was connected with a large brass manufacturing concern, which manufactured a big line of brass valves. As assistant to the cost expert it was possible to see many things that were going wrong. The cost accountant had taken charge of the department when the company was on its last legs, and was really being operated by the banks. In addition to supervising the costs, he endeavored to run the entire plant, and didn't give attention to many of the real leaks. When they were called to his attention he probably dismissed them in the rush of other thought.

Down in the plant, supervising the distribution of skilled and non-skilled labor, checking the time cards, etc., the real leaks were very evident. The foreman of the casting room was an excellent molder, but a very poor executive. He had been a molder in the shop himself, and although full of pep and ginger, he made many false moves. He was always chasing himself in circles. He would start a man on a certain job for 500 castings, and probably change his mind before the first flask was ready for pouring. He broke up routine by not knowing what he wished to do himself. At lunch time he ate with a lot of his molders in a nearby saloon. It was all John, Pete and Tom. The boys, while they recognized his authority, were always soldiering, and taking advantage of him because he was easy.

"Old Bud," as we knew him, was easy about everything. The scrap metal dealers brought all sort of light brass and copper into the plant, when the orders called for heavy material. Weights were not closely checked. The material went into a tight store room, but the door was always open, and every one helped themselves to such pieces of metal as they could have no real possible use for.

Molders worked up flasks and set them for pouring without the flask ever being inspected. They cared but little if the cores were right, and properly set. They were doing piece work, and not charged for the castings that went wrong. The core room was inefficient. The girls in the core room were about as worthless a lot as were ever congregated under one roof. They spent their time kidding male employes, and one another. A fighting, drinking crowd, that would have a hard time working in any factory.

With bad cores and bad molders, the castings could not be good. On one occasion a molder was fired, and a boy from the core room was placed on the bench. He knew very little about molding, and even on the simplest sort of work, flask after flask went wrong. As if this were not bad enough, the castings were not properly checked as taken from the molds after cooling out. As long as there was something there which resembled a casting, it was snipped at the shears, and sent to the grinding room, where it was cleaned up. It next went to the machine shop, where it was probably drilled, seated and threaded, ready to have the stems installed. Frequently a bad sand hole was not noticed until the casting had the stem fitted, and was ready for a steam trial. Many castings were weak in the walls, and not capable of handling steam or water pressure. However, instead of being inspected in the molding shop, they were passed on to the finishing room.

In the grinding room the men were paid by the day, and should have thrown out the defectives. In the finishing room some men were paid on a piece basis and some by the day, but they generally passed everything along. After paying out money for metal that is lost in every heat, wages for molding, grinding, and finishing, the castings were sent back to the metal room to be done over, and every one that had worked upon them was paid for the work. Double pay all around, double work, and probably the next casting was no better.

In the metal room the men who weighed out the metal, loaded the furnaces, and poured-off, frequently failed to make out sheets on the material which went into the furnace. The records of material going into the stock room, material on hand, and material consumed, never tallied. One man was fired when discovered trying to make up sheets for metal used the previous day by memory. He had failed to keep the records, and was trying to balance up the various heats of the various furnaces in a guessing contest. He claimed that he had made up the sheets and lost them. However, the metal record book, which had duplicate sheets, didn't alibi his statements, and when called on that score he remarked: "Oh, I forgot, I made the figures out on a piece of pasteboard, and that was what I lost."

Although there were many places in this plant where improvement could have been made, the principal feature that was wrong was that of passing defective castings through the plant and paying for finishing time all the way through, instead of carefully inspecting them at the shears. Frequently misshapen castings, which could be recognized with the naked eye, should have been thrown out by the boys, who knock the dead cores from the castings. If this one point had been fully covered, it would have saved thousands of dollars over the year, and the eventual bankruptcy of the company.

Soft Metal Melting by Gas

Article II. Gas Burning Equipments and Their Application to Existing Furnaces*

Written for The Metal Industry by GILBERT COLVILLE SHADWELL, The Improved Appliance Company, Brooklyn, N. Y.

In the last chapter we dealt with the general advantages of gas as a fuel. The soft metals were especially considered in this connection, of which the following table gives the composition and uses.

When iron rusts we have a chemical combination of the iron with water vapor and atmospheric oxygen; the rust which is produced is theoretically an oxide of iron. Due to the fact that the rusting takes place relatively

STEREOTYPE, LINOTYPE AND ELECTROTYPE METALS.

Soft Metals Which May Be Melted in a Soft Metal Furnace with Atmospheric Burners	Composition.* Sn.	Cu.	Sb.	Zn.	Pb.	Bi.	Al.	Industries to Which These Are Applicable.
	85.7	1.	10.1	2.9	....	....	....	Manufacturers of hollow ware, fancy lamps, statuary, etc.; table ware, coffee pots, etc.
	81.9	....	16.2	1.9	....	....	....	
	81.	2.	16.	1.	....	....	....	
	70.5	4.	25.5	....	....	....	....	
	22.	10.	62.	6.	....	....	....	
Babbitt metal for light duty	89.	31.	88.9	....	....	....	....	Machine shops, railroad shops. Babbitt metal manufacturers, machine manufacturers.
Harder babbitt for bearings.								
"Babbitt"	45.	51.5	13.	....	40.	....	....	
Plate pewter	89.3	1.8	7.1	....	....	1.8	....	Pewter ware manufacturers, saloon equipment manufacturers, etc.
White metal	85.	5.	10.	....	....	....	....	Machine shops, railroad shops, babbitt metal mfrs., machine mfrs., badge mfrs., die casting mfrs., candle stick mfrs., white metal casting foundries, smelters for making lead products, etc.
	5.	10.	..	83.	....	....	2	
	1.	6.	....	90.	....	....	3	
	5.	5.	5.	85	....	....	....	
	10.	3.	....	87.	....	....	....	
	....	8.	....	92.	....	....	....	
	8.	4.	....	85.	....	....	3	
Die casting metals	15.	5.	....	74.	....	....	6	Die casting plants.
	19.	5.	....	73.	2.	....	1	
	12.	11.	....	74.	....	....	3	
	31.	20.	....	46.	....	....	3	
	3.5	2.	1.5	93.	....	....	....	
	4.	1.	15.	.. .	80.	....	....	
	....	3.	....	17.	....	....	80	
Zinc	....	....	....	1.	....	....	....	Galvanizing plants.
Solders:								
Common	1.	....	....	....	1.	....	....	Plumbers (large), mixed metal manufacturers.
†Zinc	2.	....	....	....	1.	....	....	
Cheap	1.	....	....	....	2.	....	....	
White bronze	7.6	2.3	3.8	83.3	3.	....	....	Machine shops, railroad shops, babbitt metal and brazing metal mfrs., machine mfrs., etc.
	88.3	3.7	7.5	....	....	....	....	
Anti-friction bronze								
Tin and tinning	1.	....	....	....	....	....	....	Mfrs. of ornaments and all tinned ware; tin foil mfrs., collapsible tube mfrs.
Lead	....	....	....	....	1.	....	....	Toy mfrs., mfrs. of weights, tinkers' seals shot, bullets, bottle caps, etc.
Aluminum	1.	....	....	....	....	....	....	Aluminum casting manufacturers, die casting manufacturers; mfrs. of artificial limbs, teeth, etc.

*Sn = Tin; Cu = Copper; Sb = Antimony; Zn = Zinc; Pb = Lead; Bi = Bismuth; Al = Aluminum.
†This is the hardest solder. It is the eutectic alloy or the one with the lowest melting point.

In this installment it seems desirable to refer to the equipment necessary to convert coal-fired furnaces over to the gaseous fuel; moreover as the melting of white metal, such as stereotype by gas on the part of metal refiners, newspapers, etc., has become so wide spread, the writer will give this phase of the subject early consideration.

Before reaching the subject of burner equipments proper, however, it is important that we understand clearly the basic principles underlying the combustion of gas; the writer will therefore endeavor to show the difference between the ordinary atmospheric burner (sometimes called the Bunsen flame) and that of the blast type, where the air is under pressure. Further, the advantages of each type will be demonstrated.

COMBUSTION

When we speak of burning any kind of fuel, we have in mind the chemical combination of that fuel with the oxygen of the air. In many chemical reactions heat is given out. Sometimes this heat is given out so slowly as to be almost negligible but at other times it is so great that a visible flame is the result.

*Article I appeared in the issue of January, 1920.

slowly, the heat is quickly dissipated and therefore is not noticeable but it is a fact nevertheless that heat actually is given out from this chemical combination.

In the same way when quick lime is slaked for the making of mortar or plaster, the addition of the water to the quick lime gives out the heat in a much more emphatic manner.

When we burn such a fuel as wood or coal we do so by raising the temperature of that wood or coal to a definite temperature by means of kindling (wood) or some other suitable method. When the material has reached this necessary temperature it tends to convert itself into a gas or vapor which combines chemically with oxygen of the air. Coal or wood is largely made up carbon and when we burn it we get a situation similar to what takes place in the rusting of iron but instead of getting an oxide of iron we get an oxide of carbon. This particular oxide is known as carbon dioxide. Iron rust is a solid but carbon dioxide is a gas. This carbon dioxide is a waste product and, generally speaking, is of no further use after it has given up as much of the heat that it contains as possible. There is another oxide of carbon known as carbon monoxide which is also a gas

and which may practically be called carbon partly burnt to carbon dioxide. The blue flames sometimes seen at the top of a coke fire or at the top of a banked-up furnace are really the result of burning this carbon monoxide or completing the burning to carbon dioxide. Therefore, while carbon dioxide will not burn any further, carbon monoxide can be produced from partly burnt coal and can itself be further completely burned by the addition of more oxygen. City gas is, generally speaking, of about two or three types. It may consist of what is known as water gas which is largely carbon monoxide or it may consist of coal gas which is chiefly hydrogen; or again it may be a combination of the two. Natural gas is a far more complex substance and contains both carbon and hydrogen in somewhat complex forms.

TYPES OF GAS BURNERS

Gas burners generally speaking are operated under four general principles.

1—Atmospheric.
2—Fan Blast.
3—Positive Pressure Blast.
4—Pressure gas.

ATMOSPHERIC BURNERS

Atmospheric burners operate on what is usually called "the bunsen principle."

Typical examples of these (atmospheric) burners will be found on Figs. 1, 2 and 3.

FIG. 1. ATMOSPHERIC BURNER USING SINGLE LINE.

The principle involved is simple. It embodies the use of the pressure back of the gas as usually delivered in the city mains. Such a burner consists essentially of four parts, A—the cock or valves, B—the air mixer, shutter and orifice, C—the mixer pipe and D—the head. The cock or valve needs no explanation. The mixer consists of a cast iron or other "box" which contains a threaded nipple and air shutter at the end nearest to the cock and at the other end of the nipple there is a small brass spud or orifice drilled with a hole of relatively small diameter. As the gas issues through this orifice, the passage way being small, it causes the velocity of the gas to become relatively very high. It, therefore, shoots into the mixer pipe with the result that it sucks in air through an aperture made between the shutter and the box which is open to the requisite amount depending on circumstances. The mixture of gas and air thoroughly mingled passes on to the head or heads and issues from the holes in them which are termed "ports." When a burner is operated atmospherically the force of the gas delivered is seldom sufficient to entrain all the air necessary for combustion. It usually only entrains about half that amount necessary. The theoretical

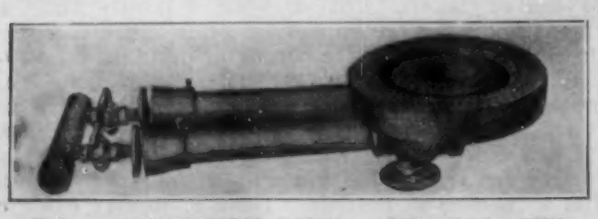


FIG. 2. ATMOSPHERIC BURNER USING TWO LINES.

amount of air required to burn city gas completely is usually about six parts to one of gas, so that three parts of the air might be drawn in through the mixers and the other three parts of air would have to be obtained from the space around the flame or flames. The air which is drawn in through the mixer is termed "primary air." The air around the heads used to mingle with the flames is referred to as "secondary air." The space under a stereotype furnace, being often ill-adapted to a convenient supply of secondary air, is one reason why atmospheric burners are not altogether suitable for this

FIG. 3. ATMOSPHERIC BURNER USING THREE LINES.

purpose, although they are sometimes employed with most satisfactory results under furnaces of special construction.

BLAST BURNERS

Blast burners of either the fan blast or positive pressure blast types operate in a manner practically the reverse of atmospheric burner. In place of the gas pressure being utilized to entrain the air, the air is put under a certain pressure and is used to suck in the gas. For this reason it will be noted that there are always two connections on such a blast burner; the straight pipe (see Fig. 4) having its own connection is connected with

FIG. 4. BLAST BURNER. AIR AND GAS COMING INTO STRAIGHT PIPE.

the air line and the offset is connected with the gas. This, of course, does not mean that the pressure back of the gas is not utilized at all as this pressure is not lost but the greater pressure is back of the air and consequently increases the velocity of the mixture of air and gas in the connecting pipe or mixer pipe between the gas and air connections and the burner head or heads. The velocity of the mixture being increased, this mixture naturally emerges from the burner ports at a higher velocity than is the case with an atmospheric burner and therefore combustion takes place at a far greater rate. In other words we are able to burn a far greater amount of gas in a certain time in a certain space than would be possible with an atmospheric burner. When we use a blast burner, therefore, we can make our burner head smaller for the same amount of "work," and this also enables us to concentrate the heat wherever it may be required. The only difference between fan blast and positive pressure blast is a relative one. A fan blast burner has air delivered at about one or two oz. (per square inch) pressure which is usually all that is required for satisfactory operation. Positive pressure air is usually considered to be a pressure (per square inch) of one to five lbs. Air at a greater

pressure is also used in certain special cases but is not to be recommended unless it is already available, owing to the fact that a special construction is often required in the burners. Moreover, it is very important to bear in mind that the PRESSURE of the air may be as high as say 200 lbs. per square inch but if the QUANTITY of air back of this pressure is not at least equivalent to six times the quantity of gas burned in cubic feet per unit of time —say per hour—we will not have sufficient to take care of the particular burner under consideration if it is intended to blow in all the air as primary air. This point needs the greatest emphasis and it is usually safe to say that even where high pressure air is available it is more convenient to have an independent blower operated by fan blast to take care of any burners which may be used. At the same time a burner designed for fan blast cannot be used for positive pressure blast or vice versa unless certain changes have been made in the mixing devices. Due to the fact that a fan blower operates on the principle of *not* building up any pressure and at the same time operates at a low pressure, the cost for the electrical energy (or as we generally say current) is usually very small indeed and figures out at only about a twentieth of the cost (for electric power) of what positive pressure costs. Fan blast is certainly the most desirable form of air pressure to be used in the case of blast burners for this reason.

HIGH PRESSURE GAS BURNERS

The fourth type of burner is that referred as being operated with high pressure gas. Such a burner operates in a manner very similar to an atmospheric burner but the gas is compressed so that it may be passed into the mixing chamber and entrain *all* the air necessary for complete combustion, usually.

The reader is referred to Fig. 5, which shows in diagrammatic form, the arrangement of a simple form of atmospheric burner and special attention should be given

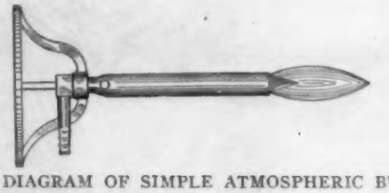


FIG. 5. DIAGRAM OF SIMPLE ATMOSPHERIC BURNER.

to the form of the flame. In the case of Fig. 6, the blast burner is set forth. In that case the "cone" of the flame is seen to be shorter, which shows that combustion takes place more rapidly, due to the air being under pressure. The blast burner will be considered at some length owing to its special adaptability to all classes of soft metal melting.

A group of hexagonal headed blast burners is shown in Fig. 7. This particular group is arranged for fan blast and is on two mixers with a gas and an air control for each mixer. The two valves shown in the illustration control the gas, whereas the air blast gates on the lower manifold control the air. It will be seen that the heads are distributed on two castings (each controlled by a mixer), and in this way either one or both may be in operation and still give a correct distribution of heat.

The principle upon which the heads operate is that of a blast burner (see Fig. 6), having the port surrounded with a refractory material for the purpose of producing incandescence so as to increase the efficiency of operation, produce radiant heat and simulate a coke fire at its best. Each head has seven such ports as can be seen from Fig. 7, and in this way the incandescence of the head is readily distributed.

Fig. 6a shows a section of part of the top of such a head. The very short flame is indicated surrounded by the refractory material.

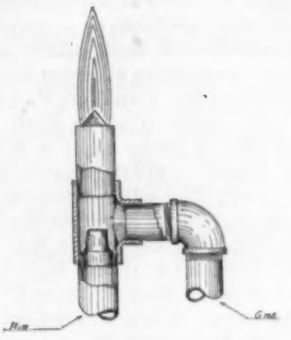


FIG. 6. DIAGRAM AT BLAST BURNER ACTION.

Summarizing, therefore, we see in Fig. 5, an ordinary bunsen burner. Due to the fact that much air is needed for combustion and cannot all be drawn in through the holes at the base (owing to the low pressure at which gas is ordinarily distributed, in cities—about 30/10" water pressure), the flame is relatively long. We have next seen that the length of this flame may be materially reduced by even a slight pressure back of the air—i. e. one or two ounces in the case of fan blast with the burner design properly arranged being all that is usually necessary. This is indicated in Fig. 6.

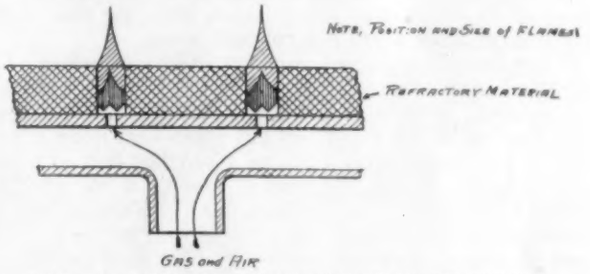


FIG. 6-A. DIAGRAM OF SETTING OF BLAST BURNER.

Then in Fig. 6a, we provided several ports equivalent in area to the one in Fig. 6, and surrounded them with a refractory material. In this case, the radiated heat causes the combustion to be brought about at an even higher rate than before. This in turn shortens the flame so that all

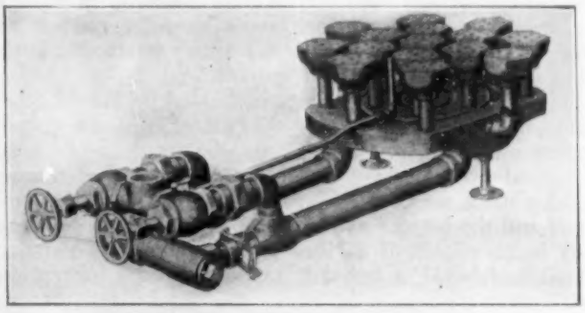


FIG. 7. GROUP OF HEXAGONAL HEAD BURNERS.

factors combined give added speed and efficiency to the gas burning system, together with the other results stated.

THE OPERATION OF BLAST BURNERS

We have now described briefly the operation of each type of burner and we have also considered the general principle under which blast burners work. They may be

operated either with fan blast or positive pressure blast or when specially arranged, they may be operated with equally satisfactory results by means of a gas compressor, blower or booster. They will also perform their function satisfactorily whether artificial or natural gas is employed without any modifications being made in their construction unless the circumstances are very out of the ordinary. It must not be forgotten, however, that natural gas contains a good deal more heat in each cubic feet than artificial gas so that in many cases it may be possible to turn down the burners when natural gas is used to a rather greater extent than when artificial gas is employed. It is here of importance to say that the heat in a gas is measured by a standard known as the "British thermal unit or b.t.u." One b.t.u is the heat required to raise the temperature of one pound of water 1° Fahrenheit. As an example, therefore, if we wanted to heat 10 pounds of water from 60° F. to 160° F. we would require 1,000 b.t.u.'s, that is to say we multiply the number of pounds of water by the number of degrees F. to which we are going to raise this water. Again: 1,000 pounds of water raised one degree F. from let us say 60° to 61° F., would also require a thousand b.t.u.'s. City gas has on an average a thermal capacity of from 550 to 625 b.t.u.'s per cubic foot. Natural gas has around 800 to 1,000 b.t.u.'s per cu. ft. or sometimes a little more. Now, when blast burners are used under a stereotype furnace, heat units are merely conveyed from the gas into the metal. In the various different burners described generally, the heat was practically all given off in the form of hot flames but in the case of blast burners, part of the heat only is given off in the form of short flames, while the remainder is given off from a red hot refractory top.

When heat is conveyed from an ordinary burner to a pot or other substance it travels by what is usually termed "convection"; that is to say this heat travels along convected waves of hot flue gases but when heat is conveyed from a hot bright body such as a red hot bed of coke, a very large part of the heat is given off by what is known as "radiation" or "radiant heat." Radiant heat is sometimes the more desirable form of heat to use in most cases because it does not give up its heat until the actual solid body is reached. The sun conveys its heat to the earth by radiation and it does not give up its heat until it actually strikes the earth or a body on the earth. On quite a cold frosty morning the sun might be shining brightly and yet the air can be below freezing point, whereas if a person stands inside a room and allows the sun to fall upon him he will feel its heat due to this very reason that it has been received by radiation in place of by convection. Blast burner heads becoming red hot give their heat off in a very efficient manner solely due to this fact, i. e., that they give off radiant heat.

There is another advantage possessed by blast burners over ordinary burners and the writer will do best by giving an example. When an ordinary domestic kettle is placed over a gas flame it will be seen that there is quite a space unoccupied by any flame between the flame itself and the bottom of the kettle. Very often this space may be an eighth of an inch or more thick. This space consists of burnt or unburnt gases which are formed due to the cooling effect of the kettle and they still remain there to a more or less degree whether the kettle contains water at only 50° F. or at boiling point (212° F.). This space creates a situation which it is desirable to avoid as the heat is not properly conveyed across it by convection methods. Such a space exists around the outside of a stereotype furnace or other soft metal pot although perhaps not to so great a relative extent as in the case of a kettle but still it does exist and in order for the heat from the burner to bridge this interval, a radiant source is far and away the best to employ in most cases.

The design of blast burners is well known and some designs and illustrations will be found in Figs. 7, 8 and 9 of this article. Fig. 7 has already been explained. Fig. 8 is for positive blast. Fig. 9 is for an electrotype furnace or a furnace of rectangular shape. Instead of the burner ports being arranged at the top of the burner head they are located right at the bottom, at which point the holes are increased considerably in size and pass through ma-

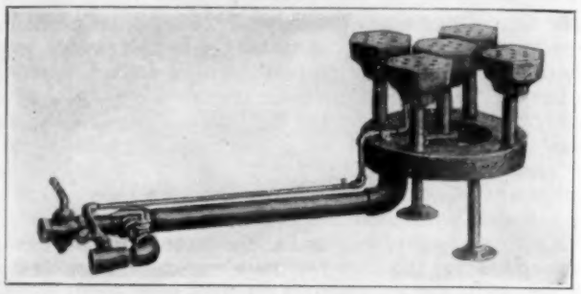


FIG. 8. POSITIVE BLAST BURNER.

terial of a refractory nature. When the burner is required to operate at maximum efficiency the flames should be so adjusted that they burn right down inside the ports in order to make the heads incandescent so that in initial operation the flames may sometimes have to be of a rather soft nature. A more detailed explanation of how this is arrived at will be given afterwards.

FAN MOTOR BLOWERS

At this point it seems especially desirable that some mention should be made of the fan motor blowers generally employed with fan blast burners.

In the first place it is most desirable that the motor blower should be directly connected and the base should

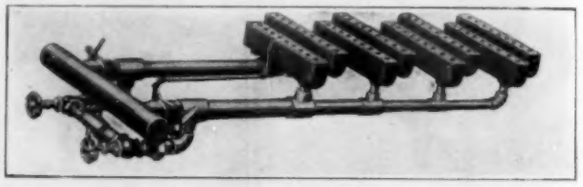


FIG 9. ELECTROTYPE FURNACE BURNER.

be suitable for placing against the wall. In such a position, the motor is out of harm's way and if it can be placed near a window so much the better.

Nevertheless the air pipe should be as free as possible of turns or bends and where these are essential they must be of long radius and as free from friction to the air as possible. No more than one bend or turn between the blower outlet and the burner should usually be required.

LOCATION OF MOTOR BLOWER

The location of the blower should always be the coolest spot available so that there is plenty of fresh air around the equipment. The most undesirable spot for the motor blower is next to the flue or above the furnace. The best spot is a position reasonably close to the furnace but near a window.

(b) Do not put a turn or bend closer than 12 or 18" from the blower outlet and use as few turns or bends as possible.

(c) If iron pipe is used for air connection use drainage fittings which have the same inside diameter as the pipe and are recessed so that the pipe shoulders on the inside make a continuous conduit. Be careful to use the long radius or long sweep fittings on this type.

Profiting

A Method of Charging for Profits, to Be Used in Connection With a Cost System

Written for The Metal Industry by W. L. CHURCHILL, Industrial Engineer*

In the metal industries the one factor that tends more than any other to make for erratic profits and precarious business existence is the lack of properly defined and understood principles for determining and applying profits.

We find concerns, in these lines especially, whose profits are out of all proportion to the energy and ability applied, and other industries operated with a high degree of intelligence and skill barely getting by, and altogether too many that do not get by.

We have read and heard a great deal about the importance of cost knowledge as a means of insuring profitable operations. The general assumption is that where such cost knowledge exists and profits continue unsatisfactory the fault lies with the management.

There are many instances where seemingly capable management, fortified by complete and thorough cost knowledge, still fails to make satisfactory return on capital investment and energy expended.

There are many other instances of abnormal profits despite apparently crude and unintelligent management.

What is the answer? Apparently, cost systems have not proved the cure-all that many of the friends of such systems prophesied. Apparently, many of the opponents of costing methods have a certain amount of justification for their opposition to and contempt for cost knowledge when they are able to point to these conflicting examples.

Even governmental investigators into causes for the high mortality rate of manufacturing enterprises—especially high in metal industries—seem to have generally overlooked the vital importance of knowing on what to base profits and what profits to charge.

Many of the phenomenally profitable enterprises have accidentally applied a principle of profiting that has netted them handsome returns despite inefficiently managed operations and lack of general cost knowledge.

Other enterprises that fail to make satisfactory progress and profits, even with the most advanced knowledge and management, are frequently handicapped by the faulty "Profiting" principles used.

The most common error in regard to "Profiting," and the one most largely responsible for the wide divergence in returns on capital and expended effort, is the general practice of using a common ratio to total costs as a basis for determining profits and selling prices.

The reason that this practice is a fallacy is that it puts a profit on the materials used in the manufactured product as well as on the conversion costs. The result is that the more valuable the materials the greater the ratio of profits to conversion costs.

It is a mistake to figure profits on materials in manufactured product that puts the price of these materials above their market values.

Profits should be a charge for the service of converting raw materials into the forms desired by the customers and they should not be expected to pay more for this service than they would if furnishing the raw materials.

It is appreciated that with industries making a single line of product or a limited variety of articles it matters very little on what profits are based. Added varieties of products or even variations in metal mixtures create variations in the proportion of material costs to total costs. With these added complications, adhering to the principle of percentage profiting on total costs, can make very disturbing and mysterious changes in total returns.

To illustrate the effect of the use of an improper basis of profiting we will cite the simplest form of comparison—the production of castings of two different alloys whose cost of conversion into similar castings may be the same but whose metal content may have wide variations in value.

EXAMPLE No. 1

	Alloy No. 1	Alloy No. 2
Labor cost	$1.00	$1.00
Overhead	1.50	1.50
Material	10.00	20.00
Total cost	$12.50	$22.50
Profit, 20%	2.50	4.50
Selling price	$15.00	$27.00
Profit on labor	250%	450%
Profit on conversion cost	100%	180%

Here is a case, where for exactly the same work we get a return of $2.50 per unit in one case and $4.50 in the other.

This difference in selling prices automatically discourages business on the expensive alloys, and induces too much of the low price business. Many foundries, in an effort to overcome this disadvantage, adopt the practice of charging a fixed profit per pound of casting over its total cost or over the market price of the metals entering therein. This is generally a safer plan although it also contains certain inequitable features. The profit does not in all cases parallel conversion cost and there is consequently a variation in the profitableness of the various lines as the following example will show.

EXAMPLE No. 2

	100 Lbs. Bronze	100 Lbs. Bronze
Labor	$4.00	$8.00
Overhead	6.00	12.00
Material	20.00	20.00
Total cost	$30.00	$40.00
Profit @ $.08 per lb.	8.00	8.00
Selling price	$38.00	$48.00
Ratio of profit to labor	200%	100%
Ratio of profit to conversion cost	80%	40%

Here is a range of from 100% to 200% profit on labor for exactly the same kind of labor and manufacturing effort.

Where profits are based on a price per pound and include the conversion cost, still greater variations in result occur.

Many foundries have earned unexpectedly large profits purely by the accident of charging profit on material and obtaining a line of work whose proportion of material cost to total cost was high. Conversely, many foundries have lost out because the ratio of profit to labor or conversion cost was low, due to there being but little metal value in their total costs.

The more expensive the metal mixtures, the greater the variations. If all metals are charged customers at market prices, and profits based on the labor or conversion costs only, it will not matter in the final returns to the

*A similar article, applied to other industries, was written by Mr. Churchill for Industrial Management, November, 1919.

business what changes in metal mixtures or metal values take place.

Foundries doing business on the basis of computing profits as paralleling their labor or their total conversion cost—total cost less cost of materials used—need never experience mysterious and unaccountable deficits, no matter to what extent prices of metals may vary in different mixtures or fluctuate in value.

The manufacturer of metal goods using metals of widely differing values can easily experience changes in total profits that are very disturbing, if not disastrous, by adhering to a faulty rule for determining profits and selling prices.

The case of a manufacturer of a metal novelty originally made out of brass but later changed to steel is an example of this possibility.

As made in brass this novelty had a cost approximately as follows:

EXAMPLE No. 3.

Materials	$1.60
Expense	.50
Labor	.40
Total Cost	$2.50
Profit (Net) 20%	.50
Selling Price	$3.00

As the market at this price was limited, it was decided to produce them in sheet steel and reduce selling prices accordingly. The new cost schedule and selling price worked out about as follows:

EXAMPLE No. 4.

Materials	$ .35
Expense	.63
Labor	.50
Total Cost	$1.48
Profit (Net) 20%	.30
Selling Price	$1.78

On basis of brass the manufacturer, employing 40 men, was able to turn out 2,500 per month, netting him about $1,250.00 profit.

When he changed over to steel he needed 50 men to produce the established quota of 2,500 per month. With the 10% bigger payroll he was able to make only $750.00 per month net profit or 40% less than when he was employing fewer people and exerting less manufacturing energy and skill.

Of course, prices were raised to overcome this difference but had the principle of ratioing profits to conversion costs been in effect in the beginning, no such change would have been necessary and the losses occasioned by the several months' sales at too low prices would not have occurred.

If profits had been ratioed to conversion costs, assuming the profit on the brass goods equitable and satisfactory, the figures would have been as follows:

EXAMPLE No. 5.

	Brass.		Steel.
Materials	$1.60		$ .35
Expense	$ .50	$.63	
Labor	.40	.50	
Conversion cost	.90		1.13
Total	$2.50		$1.48
Profit (55% Conversion Cost)	.50		.63
Selling price	$3.00		$2.11

Total monthly profits from 2,500 units:

Brass (made by 40 employees)	$1,250
Steel (made by 50 employees)	1,575

A manufacturer of metal beds made of steel and cast iron, who had adopted 33 1/3% as the proper percentage to add to his costs to obtain selling prices, added brass beds to his line.

Using his accustomed percentage of 33 1/3 as a basis of profit to add to his costs to obtain selling prices, he found he could not sell his new product, as manufacturers specializing in brass beds were selling at much lower prices. He even accused these competitors of selling at a loss. He knew that his equipment was more modern and that he could manufacture cheaper than they could. As he had never made excessive profits on his old line it never occurred to him that such a rate would be prohibitive on the brass line.

Almost every manufacturer who turns out a varied line of product, at times gets very alarming financial reports, forcing re-adjustment of selling prices and profit ratios simply because changes in sales vary the proportions of different classes of products sold. This restricts the possible total profits even though the plant may be abnormally busy.

Such restriction is due to the fact that the total profits that a manufacturing plant can make is dependent on the number of people employed and the rate of profit possible per person.

Take a manufacturing jeweler as an extreme case of widely varying material values in his product. Assuming an average of 25% of profit to total costs being used to establish selling prices, very interesting possibilities can be imagined. These possibilities, although fictitious, are illustrative of what is constantly happening in numberless manufacturing plants in varying degree.

COSTS ON SIMILAR ARTICLE IN DIFFERENT METALS.

	Alloy.	Silver.	Gold.	Platinum.
Material	$ .08	$ .35	$5.00	$25.00
Labor	.40	.80	.80	1.00
Expense	.60	1.20	1.20	1.50
Total Cost	$1.08	$2.35	$7.00	$27.50
25% Profit	.27	.59	1.75	6.87
Selling Price	$1.35	$2.94	$8.75	$34.37
Ratio of Profit to Labor	67.5%	73.7%	219.4%	6.87%

Assuming 100 producing workmen earning an average of $1000.00 per year or annual productive pay roll of $100,000.00 would mean that plants engaged exclusively on any one of these four lines of product would have profits varying from $67,500.00 per year to $687,000.00. Approximately 10 times as much profit would be made by the plant manufacturing the platinum goods as by the plant making the alloy goods although both might require about the same type and value of equipment and similar organization and operating ability and skill.

The goods requiring the more valuable materials would require larger capital investment and consequently be entitled to a greater profit. Also, such valuable goods naturally have a limited demand and are more difficult to sell. Still, there is a wide discrepancy between what might be called essential profit, and that really obtained.

There is no intent in this article to designate a standard of profit that should be considered as equitable, or to imply that there should be a limit to the rate of profit. Its only purpose is to show that the customary method of ratioing profits to total costs does create changes in total returns. The changes would be less disturbing if the relation of profits to conversion costs were always borne in mind in establishing selling prices.

Referring again to the last example and assuming that the average profit of this business equaled 100% of labor costs, there must be a large proportion of business done with alloy and silver products to offset the abnormal profits on the gold and platinum lines. If the proportion

of total manufacturing should swing towards the cheaper goods, total profits would lessen even though the plant were fully operated and the percentage of profit to total cost continued at the same rate.

It can be argued that such a change would be indicated by lessened total sales receipts and that profits should be less if sales returns were less. In a measure this is a proper statement but manufacturing is something more than plain trading. It is disposing of personal skill and organized ability as well as merchandise. To be satisfied with as small return for the services rendered as for interest on the investment in materials, is putting a very small value on the labor skill and ingenuity of the workers and executives of a manufacturing organization.

Capital may be quite satisfied with a 5% to 10% return for its use but to accept such standards as a proper return on wages and salaries is making very poor comparison of value for the latter.

It is hard to believe that a worker earning $1,000.00 per year should turn out product netting not over $100.00 in profit for his year's effort.

As a matter of fact it is rarely possible for manufacturers to maintain any standard ratio of profit to total manufacturing costs if their line is at all varied. Competition automatically forces variations that make these profits more nearly parallel the costs of conversion than total costs.

For example: a manufacturer of a full line of stoves and furnaces may be making an elaborate nickel plated parlor stove having $10.00 worth of material and $20.00 worth of labor. He may also be making a furnace with $20.00 worth of material and $10.00 worth of labor. He may find it not at all difficult to get a 33 1-3% profit on the parlor stoves, but on account of competing with strictly furnace manufacturers with his furnace, finds he has to accept 20% profit on the latter. In this case he is really receiving a larger return on labor on his furnace sales as his profit is equal to $6.00 or 60% of labor cost. His $10.00 profit on the parlor stoves nets him only 50% on the labor paid for in producing them. It means he would make a larger total profit if he employed his entire forces on the furnaces at 20% net profit, than if he had the same forces exclusively engaged on parlor stoves with their possible 33 1/3% profit on total costs.

Should profits ratio to labor? Should they parallel total manufacturing and selling costs? Should they be at a fixed rate per man hour or machine hour? Or should they be on some other basis that insures returns on the effort expended and equipment used? The answer to these questions will be largely governed by the individual requirements and conditions of different manufacturers, just as their bases of cost determinations vary; but the principle of profiting on conversion costs instead of on total costs will put many manufacturers on a much safer and less erratic basis in regard to total annual returns.

Proper "Profiting" pre-supposes a knowledge of costs, but such knowledge needs the support of its proper use before it will render the service it is intended to confer.

ROLLED ZINC PRODUCTION

The production of rolled zinc in the United States in 1919 declined over 20 per cent in quantity and 45 per cent in value as compared with that in 1918. The percentage of loss in quantity was greatest in boiler plates and heavy sheets, amounting to more than 60 per cent, but there was a loss of nearly 30 per cent in ordinary zinc sheets. The output of zinc strips, on the contrary, was slightly greater than in 1918. The losses were apparently due to the cessation of the demand for zinc for war uses.

The output of the different forms of rolled zinc during 1919, according to statistics, compiled by C. E. Siebenthal, of the United States Geological Survey, Department of the Interior, is given in the table below, which also includes the exports as shown by the records of the Bureau of Foreign and Domestic Commerce. The sheet zinc used by the government in shipping munitions overseas, however, was not included in the exports. If the figures showing the exports are deducted from those showing the production the result will be approximately the domestic consumption.

Rolled zinc has always been quoted at so much a pound, with discounts and extras for different gages and special sizes and shapes. On February 15, 1918, the base price of zinc sheets was fixed by the government at 15 cents and the price of rolled zinc plates at 14 cents, and these prices held until the end of the year. On January 2, 1919, with the passing of the War Industries Board, sheet zinc was relieved of governmental price control and the base price dropped to 13 cents a pound. On February 6 it dropped again to 11 cents, and on March 19 to 10 cents. On July 23 the price was advanced to 10.5 cents, on November 14 to 11 cents, and on December 16 to 11.5 cents. The average quotation for the base price during the year was 11.1 cents, which may be compared to 10.5 cents, the price calculated from sales.

ZINC ROLLED IN THE UNITED STATES, 1915-1919.

	1915.	1916.	1917.	1918.	1919.
Zinc Sheets—					
Quality ..... pounds	69,007,725	65,836,170	75,730,006	79,745,237	56,514,868
Value	$9,744,026	$12,280,644	$13,854,600	$12,611,294	$6,023,773
Average value per pound.....	$0.141	$0.187	$0.183	$0.158	$0.107
Boiler Plates and Special Sheets—					
Quantity ..... pounds	2,562,856	3,198,693	6,900,293	14,223,673	5,083,137
Value	$345,572	$564,814	$1,111,240	$1,912,578	$521,389
Average value per pound.....	$0.135	$0.177	$0.161	$0.134	$0.103
Zinc Strips—					
Quantity ..... pounds	20,208,058	28,039,105	35,802,652	45,255,915	46,995,742
Value	$2,937,213	$5,008,229	$5,738,285	$6,305,106	$4,902,407
Average value per pound.....	$0.145	$0.179	$0.16	$0.139	$0.104
Total rolled zinc..... pounds	91,778,639	97,073,968	118,432,951	139,224,825	108,593,747
Total value	$13,026,811	$17,853,687	$20,704,125	$20,828,978	$11,447,569
Average value per pound.....	$0.142	$0.184	$0.175	$0.15	$0.105
Rolled Zinc Exported—					
Quantity ..... pounds	.....	25,024,182	33,027,991	27,750,910	39,524,516
Value	.....	$4,540,146	$5,730,792	$4,566,756	$5,212,002
Average value per pound.....	.....	$0.181	$0.174	$0.165	$0.132
Available for consumption..... pounds	.....	72,049,786	85,404,960	111,473,915	69,069,231

Electrically Heated Japanning Ovens

An Exposition of the Advantages of the Use of Electrical Heat for Japanning Ovens*

By C. F. HIRSHFELD, Chief of Research Department, The Detroit Edison Company, Member Industrial Electric Heating Bureau

The recent extensive adoption of electrically generated heat for baking japans and varnishes and other protective coatings has served to focus the attention of the manufacturers and of central stations upon this comparatively new application of electrical energy. Many have been surprised to find that it is possible for electrically generated heat to compete successfully with heat obtained by the direct combustion of fuel, and particularly with heat derived from gas, which had become almost standard practice in these arts.

It is very easy to calculate equivalent prices of gas and of electrical energy, that is, prices which will give equal costs for heat energy. Thus, if it be assumed that, say 75 per cent of all the heat energy latent in the gas can be obtained within the oven, it will be found that about 4,500 B.t.u. supplied in gas is the equivalent of 1 kw-hr. converted into heat within the oven. With 600 B.t.u. gas this makes 77.5 cu. ft. of gas the effective thermal equivalent of 1 kw-hr. of electrical energy.

On such a basis electrical energy would have to sell at about $0.0075 per kw-hr. to give the same heating costs as are obtainable with city gas at $1.00 per thousand. There are localities in which electrical energy is purchasable at such rates in comparison with gas as to make electrical heating show the lower energy costs, but not in most large industrial centers.

In the face of such analyses, electrically heated japanning and similar ovens are being installed by progressive manufacturers in locations in which gas is procurable in quantity for $0.50 or less, and in which electrical energy wholesales at from 0.8 to 1.2 cents per kw-hr.

The reasons for such action are well grounded and sound. Rather curiously, they are of exactly the same sort as those which in an earlier period of the development of these arts, led manufacturers to adopt gas firing in preference to coal or coke firing.

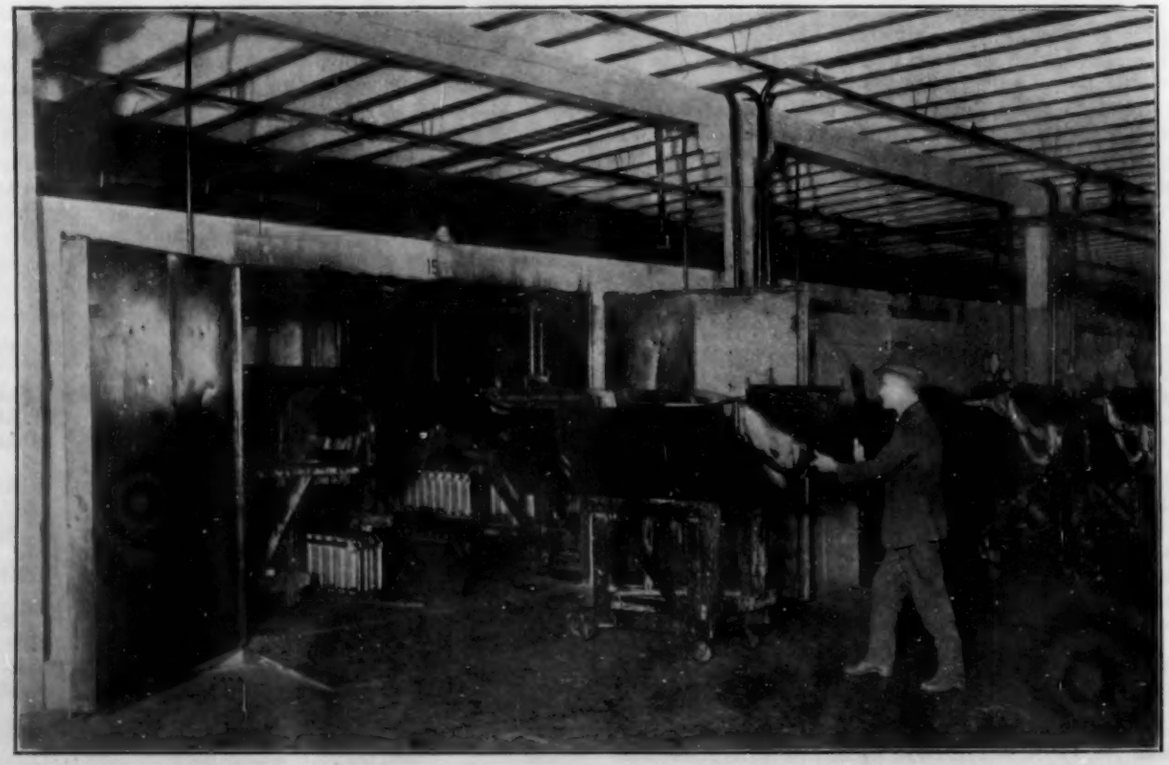
If a coal-fired installation be assumed to have a thermal efficiency of only 50 per cent, and a gas-fired installation be assumed to have an efficiency of 100 per cent, city gas would have to sell at about $0.09 to give the same cost for heat energy as would be obtained with coal at $2.00 per ton. And yet manufacturers the country over have used gas firing for years at energy costs from 5 to 10 times those obtainable with coal firing.

Obviously, relative energy costs do not tell the whole story and, equally obvious, the part of the story they do not tell must be of considerable importance to have justified manufacturers in using gas during the past decade with such a weighty differential against it.

The crux of the whole matter lies in the fact that the cost of energy used for heating in such processes is negligibly small in comparison with all of the other costs which go to make up the total cost of the product. In general, the cost of the japan or other protective coating material exceeds the cost of energy used for heating. Similarly, the labor item is generally much higher than the cost of energy. Again the cost of reworking one spoiled piece is equal to many times the energy cost for baking a number of pieces.

The cheapest method of heating is that which reduces to a minimum the total cost of a satisfactory product.

*Reprinted from N. E. L. A. Bulletin.



ELECTRICALLY HEATED JAPAN BAKING OVEN FOR AUTOMOBILE BODIES, CHEVROLET MOTOR COMPANY, TARRYTOWN, N. Y.

If improved quality has a money value, a selling value, or any other value, it may even make a process showing a higher total cost the cheapest in the end.

Electrical heating in japanning and similar industries has been adopted by many representative manufacturers of products of nation-wide reputation because they found that it gives the lowest cost of production when all things are considered.

The adoption and continued use of electric heating for these purposes by such firms as Dodge Brothers, the Ford Motor Company and the Willys-Overland Company is very significant. Over 50 different firms in the United States have already installed electric equipment for japan and varnish baking, and many others are negotiating for the purchase of such equipment at the present time.

It is also interesting to note that the use of electric heaters for japanning and similar installations is spreading rapidly despite the fact that the manufacturers of such equipments have made little effort to sell them because of the difficulties experienced in making reasonable deliveries under the abnormal market conditions which have existed for the past year or more. The users themselves are calling for electric heating and this can mean but one thing, a rational reason for its existence and use.

It is of further interest to note that two of the largest builders of japanning and similar ovens have prepared themselves to quote on ovens arranged for electric heating as well as on ovens arranged for gas heating, leaving it to the user to decide on the method of heating to be used. This is particularly significant in one case since the oven builder holds patents on a widely used form of gas oven.

In view of all these facts it is obvious that argument is no longer necessary to prove the economic feasibility of heating japanning and similar ovens electrically under proper conditions. The events of the past few years furnish ample evidence: the method is here and is in use and is giving economical results.

It is, however, necessary to call widespread attention to the numerous advantages of this newer method in order that the various central stations which are favorably located may properly and expeditiously exploit the tremendous field which this development opens up. To properly appreciate the extent of this field, it is necessary to realize that single installations offer a connected load of from several hundred to several thousand kilowatts and that processes of this sort form a large part of the manufacturing procedure in many different industries which are very widely distributed.

During the past two years japanning oven heaters with a total capacity of over 30,000 kw. have been installed in about 30 different localities and in almost as many different lines of industry. It has been assumed by some that for some unknown reason electric japanning is particularly adapted to the conditions of the automobile industry, but that it is not suited to other lines of endeavor. The fallacy of this belief is demonstrated by the figures given above.

The advantages obtainable with electric heating in this field are:

1. Great speed of production,
2. Very high quality,
3. Absolute safety,
4. Low production cost.

No one of these is attributable to any one property of electric heating; numerous things co-operate to bring each about. These are briefly considered in the following paragraphs.

Electric heating units are of comparatively small size, can be placed in almost any position and can be moved readily from one position to another until the most desirable location for each individual heater is found. As one example of such flexibility, consider the single-ended, box-type of oven. Japanners have accepted as inevitable a higher temperature near the back of the oven than that prevailing near the door; they have also accepted as inevitable a higher temperature near the ceiling than near the floor. With electric heating units of the proper sort, it is just as easy to hang heaters on the doors as it is on the stationary walls, and it is equally easy to place them on the floor. This makes it possible to obtain practically uniform temperature distribution throughout the entire oven, and this leads to high quality, and high speed. Again, assume a long, continous type of oven so arranged that the work is carried through it on a conveyor. There is some combination of temperatures along the run of such an oven which will give the best work in the shortest time and the flexibility of the electric heating units adapts them ideally to the determination and the maintenance of such combinations. The work processed in an electrically heated oven is heated very largely by energy radiated from the hot metal of the heating units and only to a slight extent by convection currents. Microscopic examination has shown that both quality and speed improve as the proportion of heat transferred by radiation increases, and an oven in which heat transfer by convection could be entirely eliminated should give maximum quality and speed.

Electrical heating is by its very nature capable of perfect and certain control. Control in the sense in which it is here used covers two different functions which may be distinguished as graduating and as limiting. Thus it is possible to automatically control the rate at which the temperature increases toward a maximum, and it is also possible to very definitely limit the maximum attained. The former sort of control is being found to be practically equal to the latter in importance when maximum quality and speed are desired.

The perfect control possible with electric heating, and the speed attainable lead toward decreased cost of production, both by virtue of decreased labor charges per unit of production and decreased losses in spoiled work. Moreover, electric heating lends itself very readily to combination with various automatic methods of handling material which tends still further to a reduction of labor charges.

When electric japanning was first introduced, it was hailed as a means of eliminating fire hazard which had always been recognized as characteristic of the japanning art. Subsequent fires in electrified ovens seemed to prove the fallacy of the early claims for safety. However, analysis and experiment showed that these fires were all due to easily preventable causes and were not inherently characteristic of the electrical method. In modern installations the causes are eliminated and the japanning equipment can be said to be fireproof in so far as the oven operation is concerned. If this alone were the only result of electrification, it would be sufficient in many cases to justify the installation of such equipment.

One company states that they have done away with pickling and are now using the sand blast.

An experienced plater pickles both malleable and gray iron for 10 minutes in one part sulphuric and four parts water cold. Then he boils out 10 minutes. For rusty work he plates on nickel lightly; then dips 10 minutes in one part sulphuric and four parts water and then washes thoroughly. After this it plates very white indeed.

The Elements of Electro-Chemistry

Some Instruction for the Plater Who Wishes to Understand the Theory of What He Practices Daily

Written for the Metal Industry by JOSEPH HAAS, JR.—Eighth Paper*

Under this heading, usually the origination of potential or the electro-motive force that is necessary to drive an electric current through a conductor is taken up. The work involves the use of logarithms and calculus which are of no use to the plater, and therefore that side of electro-motive force will not be considered. Only those topics that will give him a better understanding of the internal working of his solution will be explained. Platers frequently meet such terms as electrolytic solution pressure, electrode potentials, electro-chemical series, overvoltage, decomposition voltage and polarization. To explain the meaning of these terms and how useful and how important they are in electro-plating will be the main purpose.

Osmotic Pressure and Electrolytic Solution Pressure.

If a beaker of water is taken and filled one-third full with water and then by means of a glass tube a saturated $CuSO_4$ solution is introduced under the water, so that there is a line of separation, and the beaker is then set aside for several days, it will be found that the solution has, as far as can be told by observation, reached a uniform concentration. It is evident that $CuSO_4$ solution has diffused in all directions, even against gravity and the resistance of the water. It is therefore also evident that anything resisting the motion of the particles of the solute must have a pressure upon it, irrespective whether the ultimate cause of the motion of the particles of the solute is due to inherent molecular velocities of $CuSO_4$, or an attraction between the solvent, water, and the solute, $CuSO_4$. If a solution is separated from the pure solvent by means of a semi-permeable membrane, some results of this tendency to diffusion may be demonstrated.

A concentrated solution of sugar, colored with a little aniline green, is enclosed in a thimble of parchment paper, firmly fastened to a narrow glass tube, and the cell placed in a beaker of water. The height of the water in the beaker and the solution in the thimble must be on the same level. (Fig. 4.)

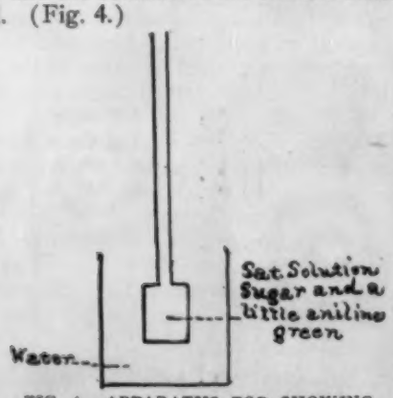


FIG. 4. APPARATUS FOR SHOWING OSMOTIC PRESSURE.

The parchment allows water to pass through, but not the sugar. It will be observed that the system is not in a state of equilibrium—water passes through the parchment into sugar solution and the latter increases in volume, consequently producing a hydrostatic pressure between the liquid in the cell and the solvent outside. We may note two facts: (1) That the change includes an expansion of the solute sugar from the concentrated to the dilute or toward uniformity of concentration. (2) Like all natural phenomena, the change is in the direction of equilibrium, for when the hydrostatic pressure has become great enough, due to the rise of the solution in the tube, or if the pressure is made sufficiently great enough at once, by the application of some outside pressure, a point of equilibrium is reached at which water will pass neither into the cell nor out of it. At that point the tendency of expansion, both of solvent and of solute in the solution is just overcome by the pressure on the solution. Hence Van Hoff's definition: The hydrostatic pressure which is necessary to bring a solution into equilibrium with the pure solvent, when the two are separated by a semi-permeable membrane, is a measure of the osmotic pressure of the solution. In other words, in all solutions there is a pressure being exerted in all directions, due to the motion of the molecules and ions. This pressure can be measured and is called the osmotic pressure.

There is a connection between the osmotic pressure of a solution and the solution pressure of metals which may be defined as their tendency to send their metal atoms into solution as ions when immersed in the solution of electrolytes. The tendency of any metal to send ions into solution is greater, the smaller is the concentration of the same kind of ions in the solution. The following are the conditions that may exist: There may be a small concentration of ions in the solution and therefore the osmotic pressure will be small. The second case would be one where we would have a large concentration of ions and consequently a large osmotic pressure which may overbalance the solution pressure. In the third case, the osmotic pressure may just equal the solution pressure.

In the first case, where the solution pressure predominates, the metal will send into the solution ions charged with positive electricity, while an equally large quantity of negative electricity remains on the metal. This will continue until equilibrium is reached between osmotic pressure and solution pressure of the metal. In the second case, where the osmotic pressure of the electrolyte is greater than the solution pressure of the metal, ions will tend to separate, making the plate positive and leaving the solution negative. In the third case, where equilibrium exists, nothing happens.

Electrode Potentials.

If, as stated above, metals show various tendencies to pass into ionic state when immersed in the solution of an electrolyte, there must exist a measure of this tendency. This measure has been termed "electrode potential," because a metal, immersed in a solution of an electrolyte, due to the tendency to send its metal atoms into the solution, gives rise to a difference of potential between the metal and the solution. The potential which a metal possesses depends upon its purity and also upon the concentration of ions of the same kind already in the solution. When a metal is positive with respect to the

*This series was begun in April, 1918.

solution it is said to have a positive (+) potential; when it is negative to the solution it is said to have a negative (—) potential.

The electrode potentials of metals are usually determined in the normal solution of one of its salts, but it must not be assumed that that is the only time a metal has a tendency to pass into the ionic state and exhibit a potential. The potential exists in the solution of any electrolyte, but of course will be different from that value which it has in the solution of its own salt. It has also been stated that the potential between a metal and the solution of its salt depends upon the concentration of the metal ions. It may be generally stated that if the electrode potential is positive, it will be diminished by dilution, while if negative it will increase with dilution, or become more negative. Besides the concentration of the ions, increasing temperature causes an increase in potential.

If we represent p as the electrolytic solution pressure and P as the osmotic pressure of the ions in the solution we have three cases:

$$(1) \quad p = P$$

Here equilibrium exists and no difference of potential exists between solution and metal.

$$(2) \quad p > P$$

Metal possesses a negative charge and the solution a positive charge.

$$(3) \quad p < P$$

The metal possesses a positive and the solution a negative charge.

The difference of potential, then, between a metal electrode and a solution of one of its salts is regarded as due to the ionization of the electrode or to the discharge of metal ions in solution at the electrode.

In the theory of voltaic electricity taken up in a previous issue the total E. M. F. of the cell depended upon the algebraic sum of the potential difference between Zn electrode and H_2SO_4 and the potential difference between Cu electrode and H_2SO_4. Cells are expressed in the following form:

$$Zn \mid H_2SO_4 \mid Cu$$

Therefore it follows that if we know the E. M. F. of a given cell, and the value of the potential difference at one of the electrodes, we can calculate the potential difference at the other electrode. For this purpose, use is made of what is termed the "standard calomel electrode," which is combined with the electrode and solution of which one wishes to determine the potential difference. The potential difference of the standard calomel cell is +0.56 volt at 18 deg. C.

Preparation of Calomel Cell.

This cell consists of mercury as the electrode in contact with a N or N/10 solution of K Cl saturated with mercurous chloride. Take a wide-mouth bottle, such as a jam jar, and get a rubber stopper to fit into it. Have three holes in the stopper. Bind glass tubing and fit as shown in picture. Prepare a normal solution of K Cl by dissolving 74.56 gms. and making up to a litre. Then take about 25 grams Hg Cl and a little metallic mercury; make a paste of it by pouring some of the K Cl solution on it and rubbing together in a mortar. The paste is washed two or three times with a solution of K Cl, the mixture being allowed to stand each time, so that the calomel will settle, and the solution is then decanted off. Finally the paste is shaken with the remaining quantity of K Cl solution in order to saturate it with Hg Cl, which should then be decanted and kept in a stoppered bottle for further use. Then place in the bottle an inch layer of metallic mercury, over that the Hg Cl paste and then insert the rubber stopper with the tubes and electrode. The electrode consists of a very small piece of platinum wire sealed in a glass tube, connection being made with mercury in the tube into which is immersed the wire that connects the cell to the rest of the apparatus. Paraffin all places around the stopper to prevent air getting into the bottle. The bottle is then filled with K Cl solution by sucking in the solution at the point marked A, and then closing the rubber tube at the point marked B, with a clip. The potential difference between mercury and the solution is +0.56 volt at 18 deg. C., the Hg being positive to the solution. The potential increases by 0.0006 volt per degree. If the K Cl solution were to form a precipitate with the solution in which the metal whose potential is to be determined, KNO_3 is used in the calomel cell instead. (Fig. 5.)

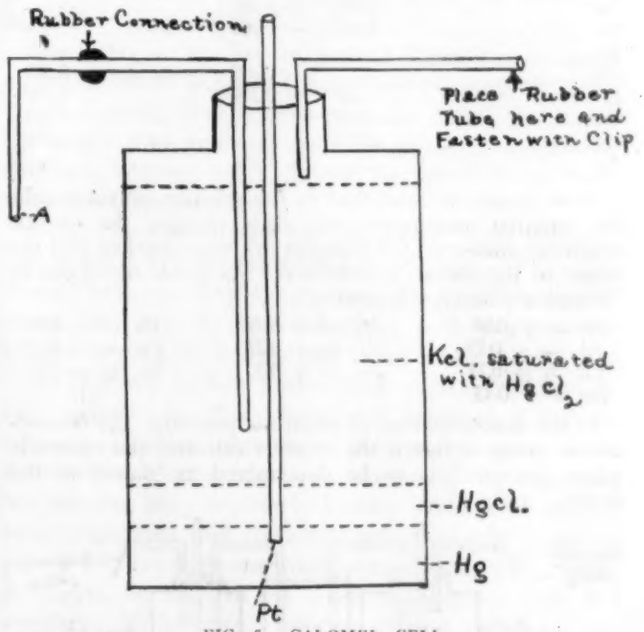


FIG. 5. CALOMEL CELL.

The following is an arrangement of the electrode potentials of elements in the normal solution of their salts compared to the Hg cell as +0.56 volt. Different investigators have found different values, so that the values given below may be found to vary if different text books on electro-chemistry are consulted. The values are, however, for practical purposes accurate enough. The order in which the metals are arranged will be found to be the same no matter what author's works are consulted.

Element	Electrode Potential	
Potassium	— 2.92	volts
Sodium	— 2.54	"
Barium	— 2.54	"
Strontium	— 2.49	"
Calcium	— 2.28	"
Magnesium	— 2.26	"
Aluminum	— 0.999	"
Manganese	— 0.798	"
Zinc	— 0.496	"
Cadmium	— 0.143	"
Iron	— 0.380	"
Thallium	— 0.045	"
Cobalt	— 0.170	"
Nickel	— 0.320	"

Tin	+ 0.085	"
Lead	+ 0.129	"
Hydrogen	+ 0.277	"
Copper	+ 0.606	"
Arsenic	+ 0.570	"
Bismuth	+ 0.668	"
Antimony	+ 0.743	"
Mercury	+ 1.027	"
Silver	+ 1.075	"
Palladium	+ 1.066	"
Platinum	+ 1.140	"
Gold	+ 1.356	"

It has been found that the nature of the negative ion has very little to do with the potential difference between a metal and its solution. Just how great this difference is can be judged from the following:

Element	Sulphate	Chloride	Nitrate	Acetate
Al	— 1.04	— 1.01	.....	.....
Zu	— 0.524	— 0.503	— 0.473	— 0.522
Fe	— 0.093	— 0.087	.....	.....
Ni	— 0.022	— 0.200	— 0.060	.....
Su	.....	— 0.085	.....	.....
Pb	.....	— 0.095	— 0.115	— 0.079
H	+ 0.238	+ 0.249	.....	+ 0.150
Cu	+ 0.515	.....	+ 0.615	+ 0.580
Ag	+ 0.974	.....	+ 1.055	+ 0.991
Au	.....	+ 1.356	.....	.....

Here it can be seen that in the solution of these salts the potential undergoes very little change. In cyanide solutions, however, the changes are very marked and the order of the metals is reversed. As given by Watts in "Practical Electro-Chemistry":

Zn = + 0.94	Ag = + 0.29	Pb = + 0.15
Al = + 0.75	Ni = + 0.27	Fe = — 0.12
Cu = + 0.77	Au = + 0.33	Pt = — 0.25
Sn = + 0.45		

In the determination of electrode potential, the connection is made between the calomel cell and the electrode whose potential is to be determined as shown in the sketch. (Fig. 6.)

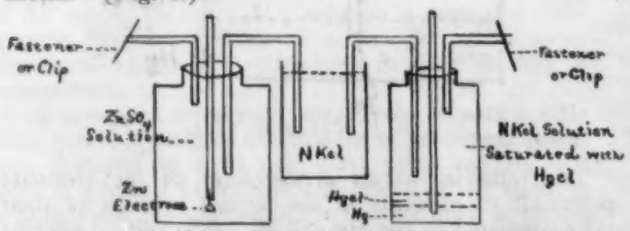


FIG. 6. APPARATUS FOR DETERMINING ELECTRODE POTENTIAL.

This is so connected to a wire bridge, a standard cell and a galvanometer, so as to oppose the E. M. F. of the standard cell and a point is arrived at on the wire bridge so that the galvanometer in the circuit is not deflected. From data so obtained the E. M. F. is calculated.

Suppose the following had been the combination:

Zn	N Solution $Zn SO_4$	Hg Cl in N K Cl		Hg

and on calculating the E. M F. of the cell it had been found to be 1.072 volts, and from the way it had been connected to the bridge wire it had been found that Hg is the positive pole; hence the current must flow in the cell from Zn to Hg. We therefore draw an arrow under the diagram of the cell showing direction of the current and place beside it the value of E. M. F.

$$Zn \mid N\ Zn\ SO_4 \mid Hg\ Cl \text{ in } NK\ Cl \mid Hg$$
$$\longrightarrow$$
$$1.072$$

We further know that Hg is positive to the solution of Hg Cl in NKCl, so that the potential here tends to produce a current from solution to Hg. This is represented by another arrow, along side of which is placed the potential difference between electrode and the solution, thus:

$$Zn \mid N\ Zn\ SO_4 \mid Hg\ Cl \text{ in } NK\ Cl\ Hg$$
$$\longrightarrow \qquad \longrightarrow$$
$$1.072 \qquad 0.56$$

Since the total E. M. F. of the cell is 1.072 volts, and since the P. D. between calomel and mercury is 0.56 volts, the P. D. between Zn and solution of $Zn SO_4$ must be 0.512, and this must assist the P.D. at mercury electrode. Thus we have:

$$Zn \mid N\ Zn\ SO_4 \mid Hg\ Cl \text{ in } NK\ Cl \mid Hg$$
$$\longrightarrow \qquad \longrightarrow \qquad \longrightarrow$$
$$0.512 \qquad 1.072 \qquad 0.56$$

From this diagram it can be seen that there is a tendency for positive electricity to pass from Zn to the solution, or that Zn gives positive ions to the solution and must therefore become negatively charged itself relative to the solution. We, therefore, say that the potential difference between Zn and the normal solution of zinc sulphate is — 0.512 volts.

Electrode potentials in electrolytes are set up not only by the simple elements, but also by alloys, gases at electrodes, oxides, hydroxides and carbonates. The potential of the alloys, oxides, hydroxides and carbonates is lower than that of its simple or elementary metal constituents, while the potential of gases depends on its tendency to ionize like that of the metals. This topic will again be taken up under "Polarization."

CURE FOR CYANIDE SORES OR NICKEL ITCH

We have had so many inquiries lately from platers who are suffering from the effects of solution on their hands that we are publishing the following recipe used by Charles H. Proctor, which has given relief to the many platers who have had occasion to try it.—Ed.

Procure some perborate of sodium and peroxide of zinc; both of these materials contain the aseptic properties of peroxide of hydrogen or dioxogen in their purest form. When using the materials, first wash the hands thoroughly in luke warm water, dry thoroughly and then immerse in a warm solution of perborate of sodium and water in the proportion of

Water ..... 2 quarts
Perborate of sodium.....¼ ounce

Immerse the hands in the solution for three to five minutes. Then dry thoroughly and each evening before retiring apply the peroxide of zinc in the form of an ointment. This ointment should be prepared as follows: Procure some lanolin or white vaseline and add a sufficient amount of peroxide of zinc to form a thick paste or ointment. Rub this ointment into the sores. Continue these applications until the sores are entirely healed.

I would suggest that your men obtain peroxide of zinc soap and use it when washing their hands.

If the blood is kept cool by the aid of a quarter of a teaspoonful of rochelle salts in a tumbler of cold water it will help a great deal.—C. H. P.

One plater states that he gets the best results by pickling in sulphuric and hydrofluoric acid..

Another reports he uses two gallons sulphuric, one gallon hydrofluoric acid to 100 gallons water at 100 degrees and this pickles his regular stock in three to five minutes, and very difficult work in ten minutes.

EDITORIAL

Vol. 18 New York, March, 1920 No. 3

THE METAL INDUSTRY

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METALS AND LIVING

To the layman most metals in the technical sense of the word, outside of iron and steel have small appeal. Steel, of course, has received wide publicity, because of the magnitude of the operations, the romance of "big business." The fact that we have them always before us in a striking sense, that is in building, bridge and ship construction. All these have tended to keep steel and iron before the public and to keep the average man informed about its developments.

The precious metals, of course, have also a large audience. Gold and silver have been popular throughout the ages. The modern precious metal, platinum, has taken a large hold upon the public imagination. And last, but not least, radium has come forth, with the widest acclamation.

At the bottom of the list stand the "base metals." The name aptly illustrates the public idea. They are "base," because they are cheap. They are cheap because they are common, obtained with comparative ease, and used so widely and in so many ways close to us that we seldom notice their existence. One or two metals of this class have attained a certain amount of notice, because of their comparative newness and peculiar properties. Aluminum, for example, has become very popularly known because of its peculiar lightness and its adaptibility for use in aeroplanes and other flying machines. Mercury is a public figure because of its close connection with the weather. Nickel has a certain amount of appeal because of its coinage value, which is, however, only one of its uses, the rest of which are hardly known to the general public. The remainder of these despised "base metals," copper, tin, lead, zinc, antimony, cadmium, bismuth, manganese, cobalt, chromium and so on, are either very little known or very little thought of. Copper, which most of the public thinks of as synonymous with the penny, finds its greatest purpose as a carrier of electricity. A close second to this is its use in brass and bronze, which touch us on every side. Zinc, which is very seldom mentioned, is applied in rust-proofing, in paint and as a constituent of the much despised brass, which was formerly thought of only as a substitute for gold to be palmed off on the unsuspecting, but which we find indispensable, because of its manifold uses. It is present as hardware on our doors, our chandeliers, fittings in cars, andirons in the home (although very few of these still exist for those of us who are city dwellers, and who must be content without open fireplaces.) It is made into beds and signs on office entrances. Zinc is even present in food, in small quantities to be

sure, but nevertheless present, in milk, oysters, and eggs.

Tin finds its place as a coating for food containers. How many times have we heard of the lowly tin can, and how much we have this same tin can to thank for the variety of food which it provides, although the tin is only a "coat" on the sheet iron can. Also, the bronze statue, plumbers' solder, the seldom heard of bearings in motors, and bells would be hard put to it without the existence of tin.

Without lead the problem of plumbing, of electrical storage batteries, of type metal for printing, and of various white paints would assume a totally different aspect, and still lead's major hold on the popular fancy is that of a counterfeit coin!

Nickel is used for high-grade alloy steels, for monel metal, which is an active resistant to corrosion, and for resistance wire in electrical heating apparatus.

Other important metals, the very mention of which outside of technical circles stamps the mentioner as "learned" or "scientific" are cadmium, which is being seriously thought of as a possible partial substitute for silver in plating work, bismuth, which is used in certain kinds of type metals, manganese, which has a variety of technical applications, but one which should surely appeal to the popular mind as a constituent of the bronze used in making ship propellers, and antimony, without which type metal would be a much more difficult problem.

COST-PLUS CONTRACT

Considerable thought is now being given to the possibilities of doing contract work on the basis of cost plus a percentage or fixed fee rather than the old principle of the fixed sum. Much controversy has resulted from the use by the government of this system due to the exigencies of the conditions at the time. During the war necessity forced the government to place large contracts long before the plans could be completed. The one great factor was speed; the cost was entirely secondary. There was not time to complete plans or to obtain competitive bids, so contracts were given to various concerns marked rush.

The advantages of this system seem to be as follows:

1. The gamble is eliminated. The contractor does not have to guess at the price that his materials will cost him when he needs them, nor does he have to be able to read the minds of his men and guess what labor will cost him. An enormous amount of trouble and a prolific source of failures and litigation is thus avoided.

2. The work can be begun at once without waiting for plans to be completed. Plans can be kept two or three jumps ahead of the construction or operation, and much time can be saved.

3. On paper at least this is a fairer system to both parties, as any savings that can be made will go to the owner of the property, while the contractor takes no chance and should be actuated only by the desire to turn out a good job. His profit is not endangered.

The disadvantages are as follows:

1. It is much too easy for an unscrupulous contractor to take advantage of an owner. Under the old system where extras had to be carefully itemized and O. K.'d before they could be charged for it was not a simple matter to slip in any unnecessary expense. Under the cost-plus system the contractor is held by nothing, and if his fee is in the form of a percentage the higher the cost the more money comes to him. This results in a serious temptation to increase costs.

2. The driving force is lacking. The constant pressure on the contractor and manufacturer to hold down his costs to the minimum is removed. Extra men might be employed who would not otherwise be used, and the standard of labor efficiency falls at once. As a matter of fact this was just the experience which the government had during the war. An atmosphere of carelessness and looseness prevailed. There were men on the payroll with no definite, fixed positions, or with nebulous duties. It is probably true that no other arrangement was possible at the time, but in general it may be said that the cost-plus system was not what it should have been in the case of too many of the government war contracts. It may be a more equitable arrangement and foreshadow a real advance in business, but so far results have not been bright enough to justify a quick change from the old system. It remains for the contractors and contract manufacturers to prove that such an arrangement is feasible, and this can be done only by showing themselves dependable and trustworthy, not only in a few isolated cases of large concerns, but for the whole body in general.

GERMAN PATENTS

A short time after the declaration of war against Germany, steps were taken by which the government was empowered to take over enemy property through the Alien Property Custodian. A number of large industrial concerns were appropriated and later sold to Americans. Among the German properties were a number of patents, the values of which were often indeterminate. Some of them were sold or leased, but many remained. A corporation was formed by the government to manage the licensing and leasing, or sale of these patents called The Chemical Foundation, Inc. This corporation has since issued a booklet including all of the metallurgical patents owned by it and which it stands ready to lease or license to any one who can make use of them. The patents embrace the whole field of metallurgy, including alloys, briquetting, crucibles, electric furnaces, electrolytic processes, fuel furnaces of all sorts, manufacturing meth-

ods, smelting, refining, welding and other processes, covering almost every metal. All information can be obtained by writing direct to this Government agent, The Chemical Foundation, Inc., 81 Fulton street, New York City.

ALUMINUM FLYING BOAT

When a number of years ago flying machines attracted the attention of the technical press THE METAL INDUSTRY mentioned that aluminum promised to become quite an important material in their manufacture and recently the New York Times published a dispatch from their correspondent at The Hague, Holland, in which he briefly described a new aluminum air craft.

We quote from the Times:—

"A special feature of the boat is that the construction is entirely of aluminum and the wings are covered with cloth, the result being that wind and weather can do little harm, and she does not need a shed. The boat weighs 2,800 kilograms, her total weight with passengers, fuel, etc., being 4,200 kilograms. She has 250 horsepower motors, giving the machinery a speed of 175 kilometers. The pilot's seat is in the forepart of the boat, while the cabin behind is capable of accommodating six passengers and a pilot."

The flying boat made the trip over the North Sea from Friedichshofen to Holland landing at an airdrome near Amsterdam.

CORRESPONDENCE AND DISCUSSION

While we cordially invite criticisms and expressions of opinion in these columns, THE METAL INDUSTRY assumes no responsibility for statements made therein.

BAYBERRY WAX

To the Editor of THE METAL INDUSTRY:

In reply to the letter of Brother William H. Parry, which appeared in Correspondence column of February issue in regards to Bayberry or Barberry wax for use on patterns, wood and metal. With regard to my advice on the use of a pure grain alcohol shellac varnish as the best for this purpose on wood patterns. All such cheap substitutes as wood alcohol shellac or copal varnishes should be avoided, or the kind of alcohol they were imbibing, which was killing large numbers of people in December in Brother Parry's section of New York, and in the New England States. Wood alcohol shellac or copal varnish becomes flaky and scales off and does not stand the exposure or moisture. Patternmakers generally make their own shellac varnish, buying only the best 95 per cent alcohol. The proportions are 3 pounds of gum to one gallon of alcohol. There is a grade of white grain alcohol shellac which may be made or can be bought from the dealers, which does not dry too slowly; also it does not produce so hard a surface as the orange shellac. Since all, or the majority of metal patterns are made from nonferrous metals, and the surfaces are smooth and leave the sand readily, and are put away in pattern storage in first class condition, with the plates or gates all brushed and cleaned off, I can see no reason why metal patterns should have a coating of wax or Bayberry unless they are iron patterns, where there is a tendency to corrosion.

P. W. BLAIR.

STEEL AND BRONZE BELLS ARE COMPARED

The Bochum Verein, the well known German steel works which specializes in the manufacture of bells, has taken exception to a statement by one Professor Dethleffen that steel bells were merely a "war substitute" for bells of bronze and that their disadvantages outweighed the advantages. This assertion, the Bochum Verein states, is nothing but a repetition of old statements which have already been disproved.

So far from the use of steel for bell founding being a "war substitute" industry the Bochum Verein has made steel bells for sixty years and before the war had made over 7,500 church bells. In Berlin alone there are more than sixty peals of steel bells. They are more durable than bronze bells and with an equal volume of sound can be heard at a greater distance. Under normal conditions, with steel about one-third the price of bronze, steel bells are at least fifty per cent. cheaper than good bronze bells, and this will presumably again be so after the war.

Exception also is taken to his statement that the cost of maintenance of steel bells is greater than that of bronze bells owing to their being so much heavier. Up to one ton apiece weight steel bells are not heavier than bronze, and above that weight they are considerably lighter; hence it is incorrect to say that they require specially constructed belfries or an increased staff of ringers. The bronze bells in the Kaiser Wilhelm Memorial Church at Berlin, which weigh 30½ tons, would only weigh 24¾ tons if they were made of steel.

The only item of increased maintenance cost of steel bells is that of renewing the rust protecting coat with which the bells are covered for aesthetic reasons, although a small coating of rust would as little affect their tone as does the oxidized patina of the bronze bells. The first steel bell was cast by the Bochum Verein in 1851, but the sixty-eight years that have elapsed since then have been long enough to prove the durability of the material. Bronze bells are very apt to crack as a result of constant ringing or of rapid changes in temperature, and in the event of fire steel bells do not melt, neither are they broken when falling from the belfry. As for the assertion that the modern steel bell is a mere utility article equally devoid of beauty of appearance and of sweetness of sound, that is a question of taste that does not admit of argument.—Exchange.

TO THE EDITOR OF THE METAL INDUSTRY:

The principal thing that recommends a steel alloy bell is its price, as neither in tone, beauty or durability do they compare with the bronze bell. The tone is rather likely to be high-pitched and harsh in comparison with a similar toned bronze bell. The steel alloy bell is very susceptible to breaking and is also susceptible to the action of the elements, and it would appear to us that in the course of time there would be danger of crystallation. Naturally, one could not expect a steel alloy or iron bell to last for hundreds of years as many bronze bells do.

As a pure noise making proposition we do not feel that there is very much difference, but as an artistic creation and musical instrument we believe the honors are entirely in favor of the bronze bell.

Jersey City, December 30, 1919.

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NEW BOOKS

Journal of the Institute of Metals, Vol. XXII, edited by G. Shaw Scott, M. Sc., Sec. Inst. Met., size 5½ by 8½ inches, cloth binding. Price, payable in advance 31s. 6d. to non-members, or 15s. 9d. to members (postage 6d. per volume extra in each case.)

This volume, published semi-annually by the British Institute of Metals, needs no introduction. A glance at some of the papers in its table of contents will show its value.

NINTH MAY LECTURE: "Radio-Activity." By Professor F. Soddy, F.R.S.

"Moulding Sands for Non-Ferrous Foundry Work." By Prof. G. H. Boswell, O.B.E.

Second Beilby Report on "The Solidification of Metals from the Liquid State." By Professor C. H. Desch, D.Sc., Ph.D.

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"Season Cracking of Brass." By Dr. W. H. Hatfield and Capt. G. L. Thirkell, B.Sc.

Note on "The Micro-Mechanism of the Ageing of Duralumin." By Professor Zay Jeffries, B.Sc.

"The Early History of Electro-Silver Plating." By R. E. Leader, B.A.

"The Properties of Standard or Sterling Silver, with Notes on its Manufacture." By E. A. Smith and H. Turner.

SHOP PROBLEMS

IN THIS DEPARTMENT WE ANSWER QUESTIONS RELATING TO SHOP PRACTICE

ASSOCIATE EDITORS { JESSE L. JONES, Metallurgical. WILLIAM J. REARDON, Foundry. PETER W. BLAIR, Mechanical LOUIS J. KROM, Rolling Mill CHARLES H. PROCTOR, Plating-Chemical CORYDEN P. KARR, Exchange-Research.

BRASS SCALE MANUFACTURE

Q.—I have a brass scale I wish to silver plate, after which I wish to oxidize black, leaving the numbers and indicating scale a bright silver finish. Would you kindly give me the required information regarding the process to obtain the above results?

A.—The methods pursued to obtain the results you desire, by name plate manufacturers would be as follows:

First fill in the numbers and indicating scales with black sealing wax applied to the scale heated to 300 degrees or more. Then cool and hard polish the surface carefully and silver plate and lacquer as usual.

A more simple method and one that gives very good results would be as follows:

Polish the scale, silver plate and repolish to a lustre and finally lacquer. When the lacquer is hard and dry fill the numbers and scale marks with dead black jap-a-lac. Let the scale stand for a short time until a little tacky, then remove the excess with a rag moistened with a mixture of equal parts of linseed oil and turpentine. The jap-a-lac will become hard and dry and gives an excellent black. The oil and turpentine do not affect the lacquer. Black asphaltum paint can be applied in a similar manner.—C. H. P. Problem 2,788.

BRAZING MIXTURE

Q.—We have an inquiry for brass, bronze and aluminum brazing rod. Can you give us any information as to the mixture used in their manufacture and also as to the flux used to clean the surfaces to which they are to adhere?

A.—We do not quite understand exactly what you mean, but we will assume that you are asking for various brazing mixtures for brass, bronze and aluminum.

If this is so, a brass mixture for brazing should not contain less than 70 per cent of copper and preferably should contain 75 per cent. True bronze mixtures composed of copper and tin can be used successfully for brazing. These mixtures run from 85 per cent of copper and 15 per cent of tin in varying proportions up to 95 per cent of copper and 5 per cent of tin, all of which may be brazed.

If, however, you mean that you want to know what are the brazing solder mixtures, then we will say that brass or hard solder used for brazing is composed of 50 copper and 50 zinc, and if used on bronze a somewhat richer in copper mixture can be used up to 60 copper and 40 zinc, depending upon the copper contents of the material to be brazed. For aluminum brazing compounds we would refer you to the dealers in aluminum solder of which there are a number on the market and some of them advertise in THE METAL INDUSTRY.

As a flux for use in cleaning surfaces, borax is the one usually used for mixing with the solder before it is applied.—L. J. K. Problem 2,789.

CLEANING ALUMINUM

Q.—What is the best method of cleaning aluminum?

A.—The best method of cleaning aluminum is as follows: Remove the grease by washing in a very weak solution of lye to which a large amount of sodium carbonate is added, in fact as much as the solution will absorb. Wash in water; dip in a solution of caustic soda of two pounds to the gallon of water; wash; dip in concentrated nitric acid until all the caustic soda has been neutralized or removed; wash in water again and dry in hot clean sawdust.—C. H. P. Problem 2,790.

COIN SILVER

Q.—Please advise what alloy is used in U. S. coin silver. Can coin silver be enameled and get as good results as enameling on sterling? Is the amount of silver in the silver dollar and in the subsidiary coins the same? How does the percentage of fineness in Canadian coins compare with U. S. coins? Is the weight of Canadian 25- and 50-cent pieces supposed to be the same as U. S. 25- and 50-cent pieces? At what price per ounce for silver would it be worth while to melt U. S. dollars to obtain silver at a cheaper cost?

A. 1. Coin silver can probably be enameled as well as sterling.

2. All U. S. coins, both gold and silver, are standard at 900 fine. The fineness of Canadian coins is as follows: Gold, $20-$10-$5-$2.50, 900 fine. Sovereign and half sovereign, 916⅔ fine. Silver, $1-50c.-25c.-10c.-5c., 925 fine.

3. The weight of Canadian 25- and 50-cent pieces is not the same as the American. The Canadian 50-cent coin weighs 180 grains; the 25-cent coin, 90 grains. The American 50-cent coin weighs 192.9 grains; the 25-cent coin weighs 96.45 grains.

4. It is worth while melting U. S. dollars to obtain silver, when the price of silver is above $1.29. Unfortunately, however, this is illegal, or it would be an excellent method of obtaining silver.—H. D. C. Problem 2,791.

GILDING TIN FOIL

Q.—Please inform me of the proper process to use in laying gold leaf on tin foil so as to get a highly burnished appearance. Gelatine and water sizes have not been satisfactory, as they are not sufficiently adhesive. Have tried 24-hour gold oil size, and then burnished with absorbent cotton, but do not get the bright finish that I desire.

A.—It is possible that "water glass," commonly termed mineral glue, could be used to advantage. This material is very adhesive.

The gold leaf gilders use a size made from parchment. Parchment size is prepared by boiling down scraps of parchment till reduced to a stiff jelly. For final use the size should be thinned down with alcohol.

French isinglass can also be used very satisfactorily as a size. There is also a French Red Gold Size to which is added the white of an egg to every half-ounce. The white of an egg should be previously whipped to a froth and then ground with the size. Water may be used to dilute the size to proper consistency.

For very high lustre the gold leaf should be burnished with agate burnishing tools. To burnish with absorbent cotton, the polishing medium should consist of gilders' writing, applied dry in small quantities to the cotton. Gilders' whiting is a very fine powder. Only this grade should be used.—C. H. P. Problem 2,792.

McADAMITE

Q.—The writer, in looking over THE METAL INDUSTRY, noted that you say Mr. A. McAdams (deceased), of A. McAdams & Sons, was the inventor of a metal known as McAdamite for strengthening aluminum castings. I have been entrusted with many formulas for strengthening aluminum for die casting, etc., and was instructed to investigate same. I would like to know before going too deep into the subject if the formulas invented by Mr. McAdams were practical for commercial use, and if you are acquainted with any of his work along this line. Tests have been made of our formulas by some of the leading universities of this country and found to be all the inventor claims for them.

A.—McAdamite is merely the name given to mixtures of copper, zinc and aluminum which were poured into chill molds, the composition of which were or are covered by McAdam's patents. It may be that through custom the name McAdamite has come to mean the mixtures of metals comprising it, but this is not what was meant by McAdam's patents, who merely covered the particular composition of molding material and who called the material so made McAdamite.

The principal McAdamite metal is composed of 80 parts aluminum, 27 parts zinc and 3 parts copper.

The McAdamite Metal Company, of Detroit, Mich., is an off-

shoot or out-growth of the original McAdamite Company, but whether they are using the molding composition as patented by McAdam and are making the real McAdamite metal I do not know. In any event, you can find all the data regarding McAdamite and so forth in the files of THE METAL INDUSTRY.

Furthermore, you write to the United States Patent Office for copies of patents issued to William McAdams on his molding compositions.—L. J. K. Problem 2,793.

REFINING

Q.—We would appreciate it greatly if you can advise us how to extract aluminum from composition running about 80% copper in a reverberatory furnace coal fired.

A.—The composition is presumably in the form of grindings, which contain emery, carborundum, etc. As you probably know, this is not any easy mixture to smelt. If you get it in the form of a very fine powder, it should be briquetted or agglomerated in some way, in order to keep a large part of your values from vanishing up the stack. A very high heat is required, and an excellent quality of lining brick in your furnaces in order to withstand both the heat and the action of the slag which will be formed. For fluxes use lime and silica. After the charge is melted, thoroughly puddled, and the lime and silica given a chance to mix with the alumina, a calcium-aluminum slag should form, leaving the copper behind. It may be necessary to aid the reaction by oxidizing the molten metal. This can be done by flapping or by blowing compressed air through it.—A. B. Problem 2,794.

RUST PROOFING STEEL

Q.—I wish to inquire for what information you can give me as to the cheapest and best method of black finishing plain steel rods in a manner that is somewhat rustproof and makes a fairly attractive finish, the lower ends of these rods being designed to set into a socket and the finish to stand only a slight amount of wear.

A.—If the steel rods are immersed in linseed oil and then heated to 600° Fahr., a permanent black coating will result that is fairly rustproof.

The Parker Rust Proof process also gives a rustproof black finish, if the articles, to produce a coating of phosphate of iron, are immersed after boiling in a heavy cylinder oil or linseed or oil, heated to the temperature of boiling water.

The Parker Process, so termed, consists of boiling the steel or iron articles in a solution of phosphoric acid and water to which is added a small amount of finely powdered cast iron or manganese dioxide. The formula is approximately:

Water	1 gallon
Phosphoric acid	4 ounces
Dioxide manganese	¼ ounce

The articles must be boiled in an iron tank for 2 to 4 hours. Similar results can be obtained if the steel articles are boiled out in a solution consisting of the following proportions:

Water boiling	1 gallon
Hydrocalcium phosphate	1½ pound

The manipulations are the same as in the Parker process. We are under the impression that the use of hydrocalcium phosphate was patented three or four years ago.

Wooden tanks may be used if the sides are lined with soft sheet steel.—C. H. P. Problem 2,795.

SAVING TRIPOLI

Q.—We have read a number of times in THE METAL INDUSTRY that it pays to save Tripoli and white polishing material that drops into the new style vacuum hoods, but we have never noticed just how it can be reclaimed. For instance, is it possible to remelt Tripoli, and is it necessary to mix some other material with it before it can be reclaimed? The writer has tried by heating it, but it refuses to flow. Can you enlighten us?

A.—Stearic acid is one of the basic factors in the manufacture of Tripoli and white composition. It is used as a binder. Frequently paraffine wax is mixed with it to cheapen the cost of production. Tripoli is more greasy than white composition, so in remelting Tripoli ends, a little mutton tallow should be used. The methods of remelting small pieces of Tripoli or white composition that have become too small for handling are as follows:

Heat a small amount of stearic acid to the fluid point in an iron pot or kettle, then add the Tripoli or white composition to be remelted, in small portions, and increase the temperature so that the mass becomes a pasty fluid mixture. Run out a small amount upon an iron slab. If not fluid enough add a little more stearic acid until it does finally run into the molds, which should be about the size of the usual Tripoli cake. As previously noted, Tripoli composition is more greasy than white composition, so small proportions of tallow should be used in connection with the stearic acid in remelting.—C. H. P. Problem 2,796.

RED BRONZE FINISH

Q.—Please advise us if you have a good solution to produce a dark red bronze finish on sheet brass.

We are at present using a polysulphide solution, which is redipped and scratch brushed three times. This is an expensive method, and we thought that it might be within your ability to help us out with this without any great expense.

A.—We do not see how you can get a dark red finish upon brass with polysulphide or any similar material. Such finishes are usually produced upon copper, or the brass is copper plated in a warm copper cyanide solution, or an acid copper solution.

It is then extremely simple to produce such a finish as you outline by using a solution of

Water	1 gallon
Polysulphide	⅛ to ¼ ounce
Ammonia	⅛ ounce

There is a dark red bronze used upon electric portables and fixtures that is produced as follows: Copper plate the brass, then brush and immerse in a solution composed as follows:

Water	1 gallon, temperature 180° Fahr.
Copper sulphate	16 ounces
Nickel salts	4 ounces

Immerse the articles to be colored for a minute; remove, wash and dry, and finally scratch brush very lightly to even up the finish. All such finishes depend more or less upon manipulation as well as the solution.—C. H. P. Problem 2,797.

STRIPPING GOLD

Q.—How can I strip the green coating from gold rings after pickling?

A.—The coating is removed by hanging the work in a stripping solution as the anode, using a carbon plate as the cathode. To make the solution, mix fifteen ounces of C. P. cyanide potassium in one gallon of water and add thirty ounces of phosphate of soda which has been previously mixed in a little water; place this in a tank, heat up well and after the work has been well scratch brushed with a steel brush, hang it in; run the current up to five or six volts, seeing that the connection is good; the article should be kept in motion, but not allowed to touch sides of the crock or the cathode, as by reason of the strong solution and powerful current, should it do so, a "strike" spot would be the result. After a few moments' immersion the work will show red and is ready for polishing.—A. B. Problem 2,798.

TYPE METAL

Q.—I wish to obtain a metal that will expand on cooling. I understand that there are alloys containing either antimony or bismuth that will do this. Can you give me any information concerning alloys of this character, such as composition, melting point hardness, etc.?

Of what is type metal composed?

A.—The metal you refer to is type metal, the formula of which is as follows:

Lead	80 to 85
Antimony	15 to 20

or

Lead	77 to 70
Antimony	16 to ..
Bismuth	7 to 15

These formulæ are not absolutely fixed, but have a latitude of several points each way. You can obtain all information concerning melting point, hardness, etc., by refering to any standard textbook, such as Metallic Alloys, by Brannt.—A. B. Problem 2,799.

PATENTS

A REVIEW OF CURRENT PATENTS OF INTEREST

1,318,054. October 7, 1919. **Apparatus for Electroplating.** Michael F. Davoran, of Cincinnati, Ohio, assignor to the Crane & Breed Manufacturing Company, of Cincinnati, Ohio, a corporation of Ohio.

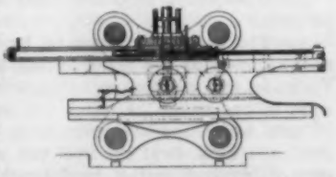
It is the object of this invention to provide cathode-bars for an electro-plating bath arranged in such manner as to receive a portion of an article-carrier therebetween for making good electric contact with the bars; further, to provide a plating tank with cathode-bars and a traveling article-carrier so correlated that a contact-part of the article-carrier is received between the cathode-bars and urged into frictional lateral contact with the bars at the respective sides of said contact-part.

1,318,336. October 7, 1919. **Making Oxid of Bismuth.** Carleton Ellis, of Montclair, New Jersey, assignor to Ellis-Foster Company, a corporation of New Jeresy.

This invention relates to a method of making oxids of bismuth and is concerned especially with the oxidation of the finely divided metal by combustion in air or oxygen or in an oxidizing atmosphere of regulated oxidizing power, and relates especially to such ignition combustion, or oxidation of bismuth which may be prepared in a powdered form by pulverizing or by comminution of the molten metal, all as will be hereinafter described.

1,317,238. September 30, 1919. **Machine for Extruding Metal.** David L. Summey, of Waterbury, Conn., assignor to Scovill Manufacturing Company, a corporation of Connecticut.

It is the object of the present invention to provide an extrusion press which is strong and rugged and which is capable of a relatively wide range of use; one comparatively simple in its construction and arrangement and at the same time thoroughly effective in performing its functions; and, withal, a press capable of operation such that each extrusion cycle is carried on with rapidity and the successive cycles are practically non-intermittent, so that the output produced satisfies the demands of commercial requirements.

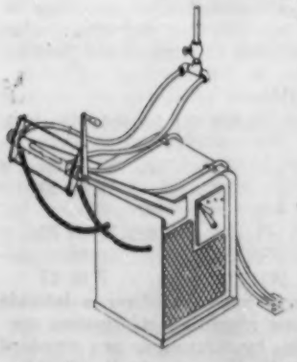


1,317,863. October 7, 1919. **Electric Furnace.** Paul de Miles, New York, N. Y.

This invention relates to electric furnaces.

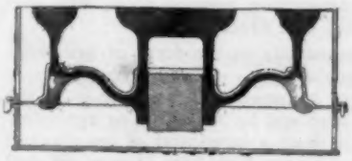
More particularly the invention is directed to electric furnaces of the crucible type, and constructed to readily and efficiently produce high temperatures.

A feature of the invention is the construction of the crucible of suitable electrical resistance material, electrodes therefor and means for maintaining the electrodes under pressure in contact with the resistance material. In the preferred forms of this invention the crucible is mounted to be tilted or rotated, to facilitate discharge.



1,316,635. September 23, 1919. **Method of Producing Composite Castings and Its Products.** William C. Norcross, of Terre Haute, Indiana, assignor to American Molding Machine Company, of Terre Haute, Indiana, a corporation of Indiana.

The object of this invention is the provision of a new method of casting metals and design of pattern whereby composite castings, for instance car wheels, of two or more metals of different characteristics such as hard and soft steel, may be produced by pouring the metals in a mold.



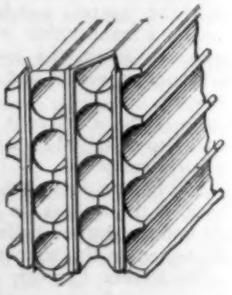
The invention embraces first, the method; and, second, the design of the pattern for the composite casting which is its product.

1,316,636. September 23, 1919. **Method of Forming Sheet Metal.** Fred M. Opitz, of Racine, Wis., assignor to Perfex Radiator Company, of Racine, Wis., a corporation of Wisconsin.

This invention relates to a method of forming sheet metal.

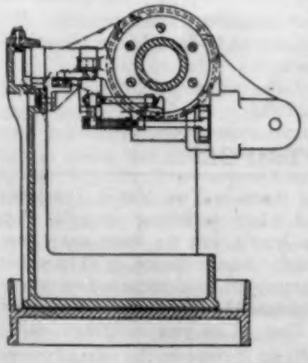
While the invention is particularly useful in connection with the formation of radiator tubes, it is not intended to limit the invention to such use or purpose only.

Radiator tubes made up of single pieces of sheet metal have been previously known, and no claim is laid to such broadly, although the particular radiator construction resulting from this herein claimed process is novel and is claimed as such in the co-pending case, Serial No. 200,252, filed March 5, 1917, of which the present application is an improvement.



1,317,766. October 7, 1919. **Metal Working Lathe.** Harold Ernest Ray Thomas and Frederick George Tams, of Stockport, England, assignors of one-third to Craven Brothers, Manchester, Limited, of Reddish, Stockport, England.

This invention relates to improvements in metal working lathes and particularly to that type of single spindle metal working machine, wherein a number of cutting tools are mounted or carried upon a turret adapted for their reception, this turret being operated in such a manner as to bring the cutting tools successively into position in order to operate upon the metal from which the piece required is to be produced, this metal being usually carried and rotated in a spindle, having its axis parallel to the axis of the aforesaid turret.



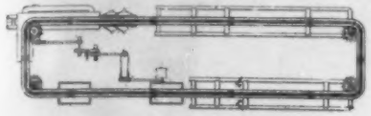
1,317,171. September 30, 1919. **Composition of Matter for Cleaning and Polishing Wood or Metal.** Gustal Magunson, of Minneapolis, Minnesota.

The composition consists of the following ingredients combined in the manner and proportion stated, viz.:

Oil citronella 20%, butter of antimony 10%, peanut oil 10%, paraffin oil 40%, white vinegar 10%.

These ingredients are to be thoroughly mingled by agitation.

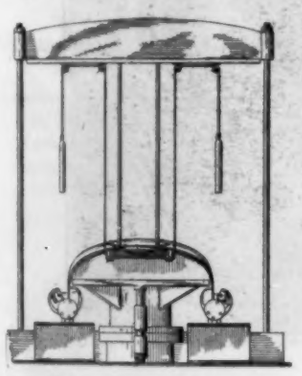
1,318,053. October 7, 1919. **Method of Electro-plating.** Michael F. Davoran, of Cincinnati, Ohio, assignor to The Crane & Breed Manufacturing Company, of Cincinnati, Ohio, a corporation of Ohio.



It is the object of this invention to provide a new and improved method of electro-plating, whereby the article being electro-plated is conveyed in a continuous operation through a cleansing bath, by being lowered into said bath, passed lengthwise there-through and then raised out of said bath, and, in similar manner, passed through a rinsing bath, above the exit end of which the article is subjected to a preferably hot cleansing spray, then through a preliminary plating bath, and a second rinsing bath, then through a dripping interval, whereupon the article is passed, as a further continuation of the operation, through a succession of plating baths of similar characters wherein successive platings are imparted to the article being plated.

1,315,937. September 16, 1919. **Forming Press.** John Dudley Artz, of Dayton, Ohio.

This invention relates to improvements in apparatus for forming sheet metal articles, and more particularly to an improvement upon and an amplification of the apparatus set forth and described in Letters Patent of the United States, 1,164,698, issued under date of December 21, 1915.

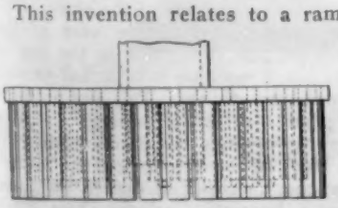


The object of the invention is to simplify the structure as well as the means and mode of operation of such apparatus whereby it will not only be cheapened in construction, but will be more efficient in use, capable of being easily and quickly operated, economical in operation, and unlikely to get out of order.

A further object of the invention is to produce an improved means for forming sheet metal articles or giving to bodies of sheet metal or similar material a predetermined contour without the use of a die.

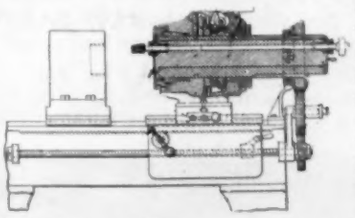
1,316,973. September 23, 1919. **Rammer for Compacting Sand in Molds.** Nicolas Rappez, of St. Pierre, Belgium, assignor to Acieres et Fonderies D'Art de Haine Saint Pierre et Metallurgique Lilloise, Société Anonyme, of St. Pierre, Belgium.

This invention relates to a rammer for compacting sand in molds. One object of the invention is to provide a rammer of simple and practical construction, adapted to secure a technically perfect compacting of the sand in the mold or in other words to secure a more or less important compacting of the sand at given places of the mold while maintaining a certain porosity at other places in order to permit the escape of the gas and to facilitate the shrinkage of the metal when it cools.

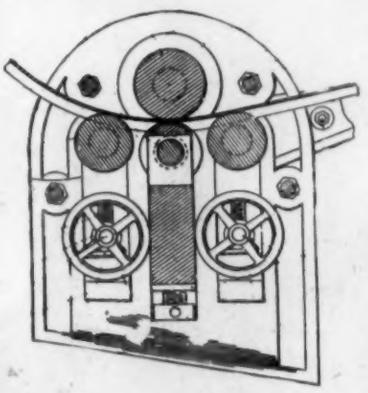


1,316,718. September 23, 1919. **Planetary Metal-Working Machine.** Peter P. G. Hall, of Philadelphia, Pa.

The object of the invention, in its broader concept, is to provide a novel association of means capable of a wide range of uses, as indicated, in which a mechanism is arranged so that there may be a relative helical movement between a rotating cutter and the work operated upon to facilitate, in one instance, the cutting of threads by making a plurality of threads simultaneously, or, in another case, the milling or boring of a surface, such as that of a cylinder, relatively rapidly.



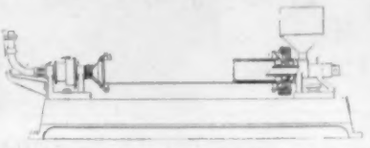
1,317,264. September 30, 1919. **Sheet Metal Bending Machine.** Charles P. Buck, of Topeka, Kansas



This invention relates to flanged sheet metal bending machines, and has for its object to produce a machine by which flanged flat plates or sheets may be transformed into uniformly-curved plates without changing the width of the plates or flanges or the angular relation of the latter, so that all of the plates shall be interchangeable.

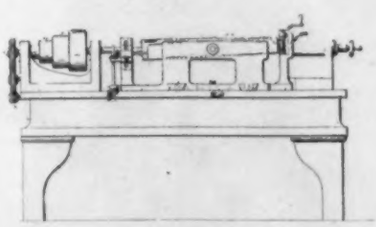
1,317,120. September 23, 1919. **Centrifugal Casting Machine.** Franklin H. Wolever, of Chicago, Ill., assignor to Ideal Roller Company, of Chicago, Ill., a corporation of Delaware.

Among the objects of the invention is to produce a novel apparatus or machine for this purpose, so constructed and arranged as to facilitate the forming of the liner and the roller shell; to provide a machine of this character in which the centrifugal mold may readily be applied to and removed from the driving and supporting elements of the machine; to provide a novel means for centering the centrifugal mold in the supporting and driving elements; to provide novel means of cooling the mold during the shell forming or casting operation and to otherwise improve and simplify casting machines of this general character.



1,320,296. October 28, 1919. **Metal-Working Machine.** Walter H. Underwood, of New York, N. Y.

The present invention relates to apparatus for producing metal hair, and more particularly to improvements whereby the cutting of the hair is made by successive portions of the cutting edge of the tool. The objects of the invention and features of novelty will be apparent from the drawings.

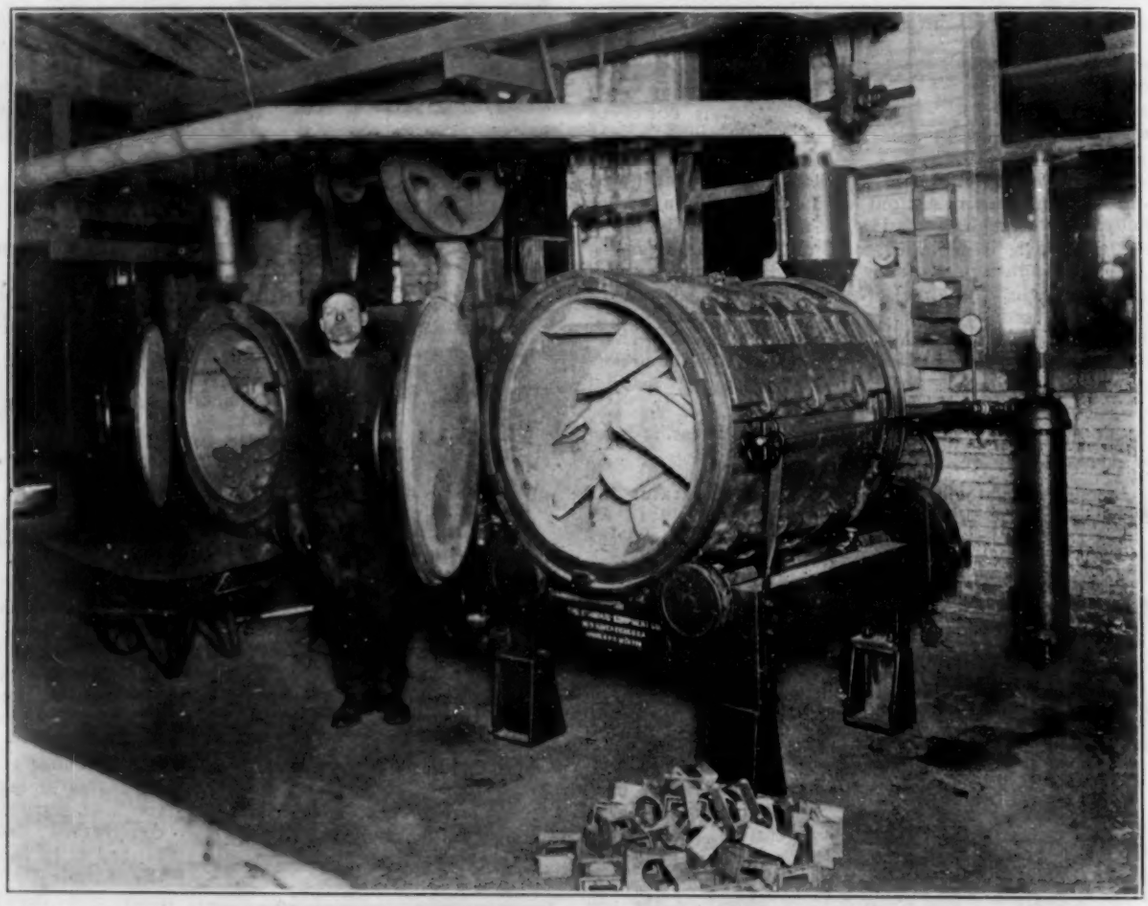


EQUIPMENT

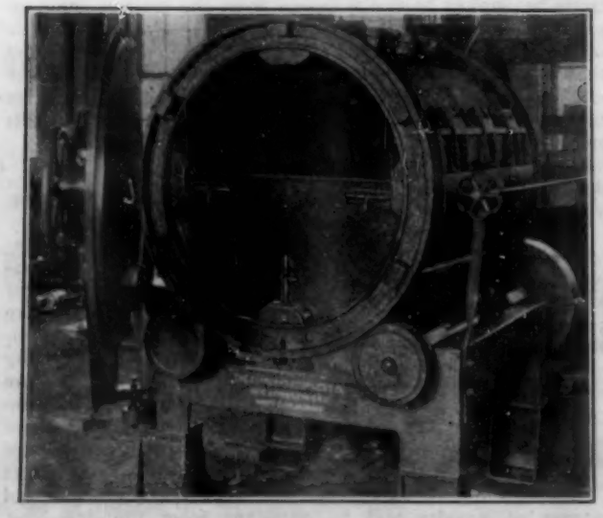
NEW AND USEFUL DEVICES, MACHINERY AND SUPPLIES OF INTEREST

A NEW SAND BLAST BARREL

The Standard "Radial Blast" is claimed to be a big improvement over the ordinary sand blast barrel. By referring to the cut it will be seen that there is no hopper or nozzles inside of this machine to interfere with the turning over of the material to be cleaned. The barrel can be charged to ¾ of its full capacity. The nozzles are arranged so that they will blast through the cast steel cleats, and the abrasive material (either sand or grit) automatically sifts through the shell into the sand chambers. On the No. 3 machine it will be noted that there are four rows of nozzles. Each row of nozzles automatically blasts through a section of about 90 degrees of circumference, while passing over the top of the machine. The air is then cut off when the next row of nozzles start to blast, causing a continuous blast across the top of the work while it is being turned over, thus exposing the different surface. This machine is entirely self-contained and dustless, so that it can be operated in any part of the plant. The dust caused by the blast is removed through the rear of the machine by means of an exhaust pipe connection to the top of the expansion chamber. The No. 3 machine is in actual service and is said to have proved to be very efficient. This size machine will hold as much as 2,500 pounds of small castings for one charge. For cleaning the small castings an auxiliary door is provided so that the barrel can be easily charged to its full capacity. The company now has a number of orders for these machines and expects to have a descriptive bulletin about April 1st and will be pleased to mail one to those who may be interested. The machine was invented and designed by Mr. Fred. Washburn and John R. Sheldon. The former is general superintendent and the latter mechanical engineer. The barrel is manufactured by the Standard Equipment Company, 185 Church

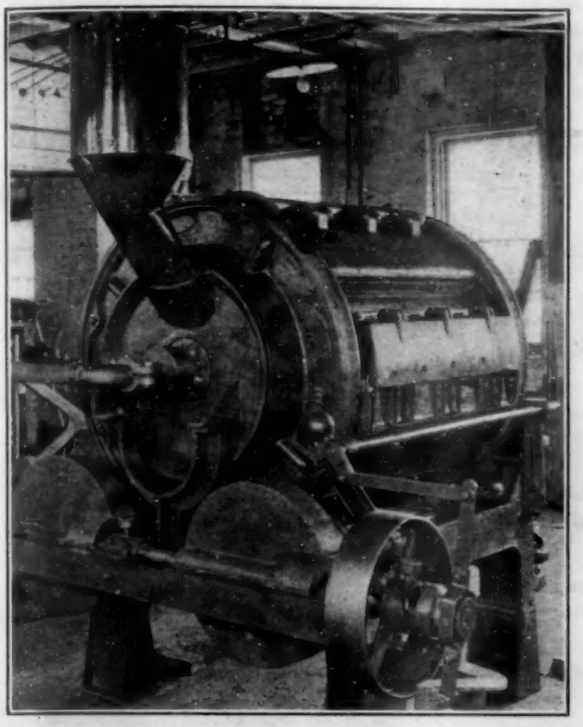


CHARGED, READY TO CLOSE AND GO TO WORK.



THE BARREL OPEN, SHOWING INNER CONSTRUCTION.

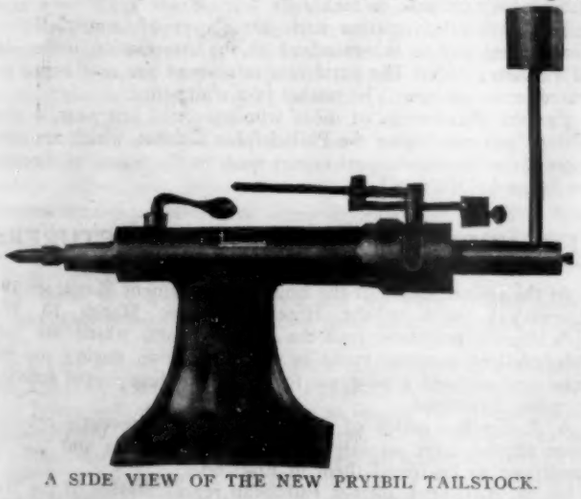
street, New Haven, Conn., of which Mr. Charles A. Driesbach is manager. Bulletin S. R. B. will be sent on request.



A VIEW OF THE BACK.

A NEW STYLE TAILSTOCK

A new type of tailstock has been developed by the P. Pryibil Machine Company, New York City. The illustration shows the features of the machine. When the horizontal lever is engaged machine is ready for boring and burnishing. When weighted



A SIDE VIEW OF THE NEW PRYIBIL TAILSTOCK.

rod is brought forward and downward toward operator it engages in slot which is cut on a downward and forward angle toward headstock, and holds blank by automatic pressure.

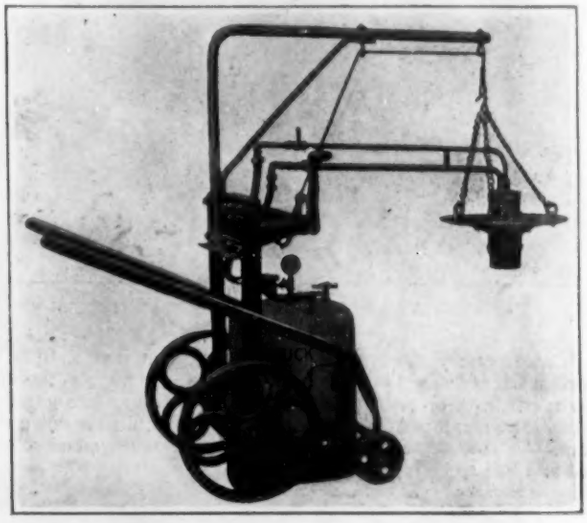
DRYING BULL LADLES

Wood fires for drying out the lining of large Crane and Bull ladles have been found a very slow, smoky and expensive proposition.

There is now marketed an apparatus which the manufacturers claim will thoroughly heat and dry the lining of a 50-ton ladle in 15 minutes, depending upon the heat required.

This apparatus consists of a 20-gallon steel oil tank, equipped with 150-lb. pressure gauge, oil and air regulating valves, one length of special oil resisting hose and one length of high pressure air hose, one burner with long handle and deflecting plate. The tank is mounted on a strongly built angle iron truck. The truck has sturdy handles and can be easily moved from place to place, as it is supplied with two large 18" wheels and two small wheels.

Attached to the truck is a swinging davit, from which is suspended by steel cable the burner with the deflecting plate. The



A PORTABLE LADLE DRYER.

deflecting plate may be lowered or raised as desired, as the steel cable is connected to a small winding crank on the truck.

The burner operates with compressed air from 20 to 100 lbs. pressure. Burns fuel, crude or kerosene oil. Lights instantly.

The flame of the burner is directed down towards the bottom of the ladle. Spreads evenly and quickly, heats the sides and bottom of the ladle white hot if necessary.

Manufactured by the Hauck Manufacturing Company, Brooklyn, N. Y.

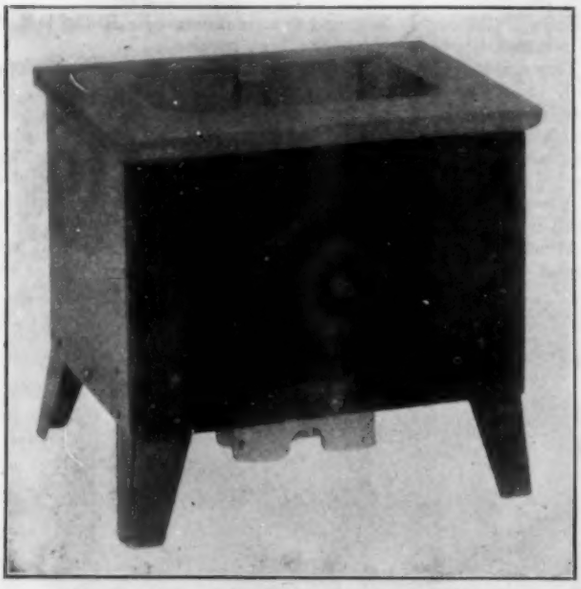
NEW ELECTRIC METAL MELTER

The General Electric Company has developed a new electrically operated device for melting lead, babbitt and similar metals, known as the 25 Pound Electric Metal Melter Bench Type Pot, which is designed to eliminate the loss of time and material, and risks of losses by fire, accidents, etc., which attend the melting of metals in haphazard containers, with a gasoline torch to supply the heat.

This new pot is of very solid, durable construction, having four short legs on the bottom and a flange on the upper rim, so that it may either be stood on a table, or the floor, without fear of upsetting, or lowered into a hole, so as to be flush with the top of the table. It is fitted with a plug and socket fixture that can be attached to any electric light circuit.

The heating element is a coil, wound around the container from top to bottom, and thoroughly insulated from the outside, thus insuring an even distribution of heat through the contents of the pot, and preventing temperature loss due to radiation.

The automatic regulation, which is the principal feature of the device, has been obtained by constructing the heating element of wire which has a positive temperature coefficient. That is to say, that when the temperature of the heating element rises, its resistance rises proportionally, thus limiting the current and, consequently, the heat. When the cold metal is put into the container, the initial rise of current is enough to melt it quickly, but, after it is melted, the current is automatically reduced to just enough to keep it molten, but not to burn it. This does away with the thick scum of oxidized metal around the top, which was a prominent feature of the old method.



TWENTY-FIVE POUND ELECTRIC METAL MELTER
BENCH TYPE POT.

It also permits the operator to go away and leave the pot to itself when necessary without fear of wasting good metal through too much heat, or setting something on fire. With the gasoline torch, the operator had the single alternative of turning down the flame to a safe degree, which usually meant that the metal solidified and had to be melted all over again.

SOME USES OF MAGNESIUM

A Table Showing the Present and Possible New Fields
Shawinigan Electro-Metals Company, Chicago, Ill.

MAGNESIUM IN METALS

ALUMINUM

*1.—Deoxidizing agent used in the proportion of 0.2% to 0.5%.
*2.—Alloy as hardener and strengthener improving machining qualities, used in proportion of 0.5% to .0%.
3.—Remelting scrap aluminum for casting ingots.

COPPER

*1.—Deoxidizing agent, used in proportion of 0.02% to 0.1%.
2.—Alloy as hardener.

BRASS

*1.—Deoxidizing agent, used as in copper.

BRONZE

*1.—Deoxidizing agent, used as in copper.

ALUMINUM BRONZE

*1.—Deoxidizing agent, used as in copper.

MANGANESE BRONZE

*1.—Deoxidizing agent, used as in copper.

NICKEL

*1.—Deoxidizing agent, in production of castings and ingot for rolling, used in the proportion of 0.08% to 0.15%.

*Indicates present commercial use.

ASSOCIATIONS AND SOCIETIES

REPORTS OF THE CURRENT PROCEEDINGS OF THE VARIOUS ORGANIZATIONS

AMERICAN FOUNDRYMEN'S ASSOCIATION

The annual conventions of the American Foundrymen's Association and the Metals Division of the American Institute of Mining and Metallurgical Engineers, will be held jointly in the city of Columbus, O., during the week of October 4, 1920, and in conjunction therewith there will be held the usual exhibit of foundry and machine shop equipment, tools and supplies.

The exhibits will be housed in the buildings of the Ohio State Exposition Grounds which are located within the city limits and a 15-minute car ride from the leading hotels. Four street car lines afford transportation, with a loop at the grounds from where there is a covered passage way leading to the first building and all the buildings that will be used, are connected by covered passage ways.

There are railroad switches and unloading facilities along the side entrance to the grounds. The buildings are constructed of brick, steel and concrete, and all have concrete floors, with the exception of the arena, which has a dirt floor. Water, gas and electric current is available, and the splendid facilities will make possible a more complete and extensively operated exhibit than ever before.

The 1920 Exhibition Committee appointed by President Koch, are as follows:

C. S. Koch, president, A. F. A., chairman, Fort Pitt Steel Casting Co., McKeesport, Pa.

W. R. Bean, vice-president, A. F. A., Eastern Malleable Iron Works, Naugatuck, Conn.

H. R. Atwater, Osborn Mfg. Co., Cleveland, Ohio.

S. T. Johnston, S. Obermayer Co., Chicago, Ill.

V. E. Minich, American Foundry Equipment Co., New York.

J. P. Pero, 1216 Boatmen's Bank Building, St. Louis, Mo.

J. S. McCormick, J. S. McCormick Co., Pittsburgh, Pa.

Thomas W. Pangborn, Pangborn Corp., Hagerstown, Md.

It will be several weeks before the Committee will be ready to submit a formal layout of the available space, and in the meantime they would appreciate advices from exhibitors as to the approximate amount of space they would like to have, and all the information they wish to give as to the character of the exhibit they propose to make.

For further information write for a copy of General Bulletin No. 1, sent out to the members of the Association under date of February 24th. The hotel lists mentioned are now being prepared, and copies will be mailed in a short time.

For the information of those who exhibited last year, a sheet giving facts concerning the Philadelphia Exhibit, which are taken from the manager's annual report made to the board of directors on January 13th, has been sent out.

FOUNDRY EQUIPMENT MANUFACTURERS

At the annual dinner of the Foundry Equipment Manufacturers' Association, held at the Hotel Astor on March 10, 1920, Mr. Mimich, president, read the annual report, which set forth the excellent progress made by the association during the past year, and outlined a program for 1920 including useful activities in many directions.

A. J. Findlay, editor of the Iron Age, who recently returned from abroad, gave an interesting talk on business and political conditions as he found them in England.

Dr. H. A. Givens, former European representative of the New York Herald, and now connected with the Century magazine, made a most interesting address describing the political conditions that existed at the time that the armistice was signed and with which the Peace Conference was surrounded.

The officers for the ensuing year were re-elected as follows:

President, V. E. Mimich, American Foundry Equipment Company, New York City.

Vice-President, F. G. Smith, Osborn Manufacturing Company, Cleveland, O.

Secretary-Treasurer, A. O. Backert, Penton Publishing Company, Cleveland, O.

AMERICAN ELECTROPLATERS' SOCIETY, ST. LOUIS, BRANCH BANQUET

St. Louis Branch held a most successful banquet on the evening of March 6th. About 115 persons were at the tables to partake of a splendid dinner, which was followed by a program which conformed to purpose of evening, that purpose being to bring together for a social time, our employers, our friends and our families. After a well delivered address of welcome given by our president, H. Deubelbeis, our Supreme President, Oscar E. Servis, of Chicago, who was royally welcomed, made an address on "What the Society Has to Offer to the Employer," this was followed by a paper on "Electro-Plating in 1920." which we admit was not always within the limitations of the subject, yet was allowable, because of certain illustrations necessary to impress his thoughts upon the hearers; of course, as only our H. J. Richards could do that.

When E. Lamoureux was introduced as the "father" of the branch, he admitted his part and congratulated us for being a healthy infant, and inquired how it was possible to make the showing we did. Naming the committee in charge tells the story: E. J. Musick, F. C. Rushton, F. E. Ferrio; H. J. Richards, J. Humbrecht.

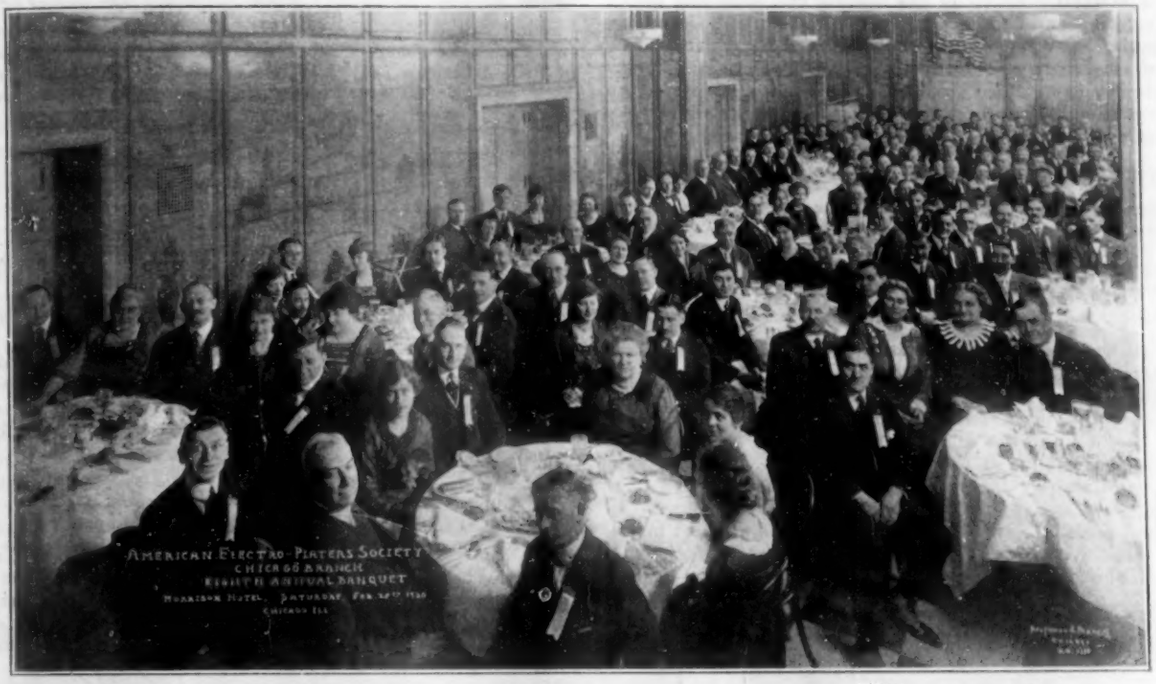
Dancing was indulged in until a late hour.

Belleville was well represented and we were pleased to see Messrs. Drochelmann and Spindler from Evansville, Ind. Come again.

In a very serious talk he told of the appointment of a Research and Publicity Committee at the Philadelphia Convention, their duty being to find ways and means to finance the research work further, until such time that Congress can be brought to see and understand that electro-plating plays an important part in the industry of the nation. To this extent it is the intention with the approval and in conjunction with the Bureau of Standards to interest the various manufacturers individually or through their associations in financially supporting this move. The plan is to interest at least one hundred concerns to subscribe $200 each per year for a period of five years to carry on this work. We are pleased to state that we have already received some very encouraging reports from some of the largest manufacturing concerns in the country offering their support of this plan which they hope will become a fact.

The advantage of such a plan would be that any work started would have continuity as the same men would probably carry on for several years, regardless of the lack of a sufficient appropriation by Congress which has compelled the Bureau in recent years to curtail its activities and dispense with its employees engaged in research work, just when they have gotten fairly started. It would also provide for those engaged to concentrate and specialize instead of scattering their efforts over unrelated problems.

H. H. WILLIAMS.



PICTURE OF THE ANNUAL BANQUET OF THE CHICAGO BRANCH OF THE AMERICAN ELECTROPLATERS' SOCIETY, FEBRUARY 25, 1920.

THE ELECTRIC FURNACE ASSOCIATION

Coincident with the meetings of the American Institute of Electrical Engineers, and the American Electrochemical Society, there will be a meeting of the Electric Furnace Association, in Boston, from April 8th to 10th. The annual election and business meeting will be held on April 8th. On one other day there will be a session on the proper training of operators of electric furnaces. The Association will meet with the other two societies mentioned above, during their discussion on "Adequately Trained Men—An Urgent Need of the Electric Furnace Industry," "Electrically Produced Alloys" and "Power for Electrochemical Purposes."

The combined program will be of particular interest to electric furnace operators, inasmuch as subjects of such vital importance to the industry will be discussed. Indications are that there will be a considerable attendance of electric furnace men at these sessions, and that very excellent papers will be presented.

During the meeting, the headquarters of the Electric Furnace Association will be at the Copley-Plaza Hotel. For information, write to C. G. Schluederberg, secretary, Box 911, Pittsburgh, Pa.

NATIONAL VARNISH MANUFACTURERS

The plant managers of the New York and New Jersey section of the National Varnish Manufacturers' Association held their seventh meeting, Thursday, February 19th, in New York, Mr. Frank Schumann, of Hilo Varnish Corporation, presiding.

The discussion of the evening on the subject of equipment.

The next meeting was held Thursday, March 18; topic of the evening was "Testing Check on Raw Material, Manufacture, and Finished Products."

PERSONALS

ITEMS OF INDIVIDUAL INTEREST

Alexander L. Feild, research metallurgist with the Union Carbide & Carbon Corporation, has been transferred from the National Carbon Company's plant at Cleveland to the Electrometallurgical Company at Niagara Falls, N. Y.

Alf. Tjersland, director of the heating and plumbing goods manufacturing and contracting firm of **E. Sunde & Company,** Christiania, Norway, is now in the United States for a few months' stay, partly to study American products and methods. He is accompanied by **John Karlsen,** an engineer of the company, and he has been joined by **Sigurd Frivik,** works manager of the company, who has been here some time.

Lawrence M. Brile, who has been connected for the last five years with the United Smelting and Aluminum Company, Inc., as vice-president and sales manager, severed his connection with that company on January 1, 1920, and has assumed the presidency of Brile & Ratner, Inc., a New York corporation formed to engage in the metal and chemical brokerage business. Mr. Brile will take charge of the non-ferrous metal end of the business, while Mr. Ratner, who is well known in the chemical field, will take charge of the chemicals department. The office of Brile & Ratner, Inc., is located temporarily at 115 Broadway, N. Y.

H. B. Saeter, with the Norsk Aluminum Company, Christiania, Norway, is in New York on a visit. He will return shortly.

DEATHS

HERMANN GEHNRICH

Hermann Gehnrich, president of the Gehnrich Indirect Heat Oven Company., Inc., Brooklyn, N. Y., died on February 18 after a short illness of bronchial trouble.

He was born in Magdeburg, Germany, on July 11, 1851. At the age of 13 he was apprenticed to a sheet metal worker in Gentin, Germany; at the age of twenty he came to this country and shortly thereafter became a citizen.

Forty years ago, on November 13, he started in business on a small scale in New York City, doing general sheet metal work. He invented and patented numerous devices, the principal one of which is the Gehnrich indirect gas-heated

HERMANN GEHNRICH.

radiator type oven, used extensively for baking japans, enamels, etc. This invention radically changed, even revolutionized the method of baking japanned articles.

The steady demand for his product necessitated larger factory facilities at three different times, the last being the plant now occupied by the company, which was built in 1913 by Hermann Gehnrich. In the year 1915 he and his three sons, who had been in business with the father since boyhood, incorporated under the heading of Gehnrich Indirect Heat Oven Company, Inc.

He did not live to see the completion of the large plant now being erected in Long Island City, covering the entire block on Skillman, Honeywell and Buckley streets, an edifice he would have been justly proud of, crowning his efforts and close attention to work which he loved.

CHARLES A. WEEKS

The American Metallurgical Corporation, Franklin Trust building, Philadelphia, announce the death of Mr. Charles A. Weeks, the inventor of the original Weeks Rotating Furnace for non-ferrous metals, on Saturday, Feb. 21, 1920. His death was both a complete surprise and shock to friends and associates alike.

Mr. Weeks' entire life was spent in connection with developments, the majority of which were in connection with the improvement of metals, especially those of the non-ferrous types. Previous to the invention of the electric rotating furnace, Mr. Weeks built a number of rotating gas and oil furnaces from which he obtained his original basic ideas covering the subject.

He was a true pioneer, having invested his own capital for the manufacture of a furnace of approximately two tons capacity, which was installed and operated at the General Electric Works, Schenectady, N. Y., nearly eight years ago. The reason that the furnace was not immediately placed on the market was because of the fact that the non-ferrous field had developed only to a small extent, crucibles were cheap and a systematic investigation of losses in melting had not shown up the tremendous losses through volatilization.

ISAAC SHONBERG

Isaac Shonberg, president of I. Shonberg, Inc., died at his home in Brooklyn, N. Y., March 8, 1920.

Mr. Shonberg was born in Germany November 19, 1850. He is survived by his wife, two sons, two daughters and a brother.

He established his business in 1892 for manufacturing type and babbitt metals, which he incorporated in November, 1917, and has been located for many years at 122 Flushing avenue, Brooklyn, N. Y.

TRADE NEWS

BUSINESS REPORTS OF THE METAL INDUSTRY CORRESPONDENTS

EXHIBIT OF WATERBURY INDUSTRIES

Some of the reasons why Waterbury has something on everybody were blazoned in brass at the State Agricultural and Industrial Exhibition held in February in the State Armory in Hartford. Five booths representing the Scovill Manufacturing Company, the American Brass Company, the Chase Companies, the American Metal Hose Company and the American Pin Company tried to give the world some idea of the number and variety of articles and material manufactured in Waterbury

in war and peace times. Of course it was only a slight idea. Only five concerns were represented and these five could not begin to display samples of their manufactures in the space allotted them. But their object was to select some of their principal articles, eliminate as far as possible any duplications, and thus give a general idea of the size and scope of Waterbury's brass industry.

The exhibit was particularly interesting because factories like the Scovill Manufacturing Company, the American Pin Company and the Chase Companies displayed the finished articles, while the American Brass Company's exhibits were largely of materials which go into the making of various brass taking up five booths, so that a synopsis of the story of brass was obtained from visits to the five booths. Each factory had a representative on hand to give details to curious questioners and there were many whose curiosity turned to awe when they heard figures running up to the millions given concerning the number of war articles made.

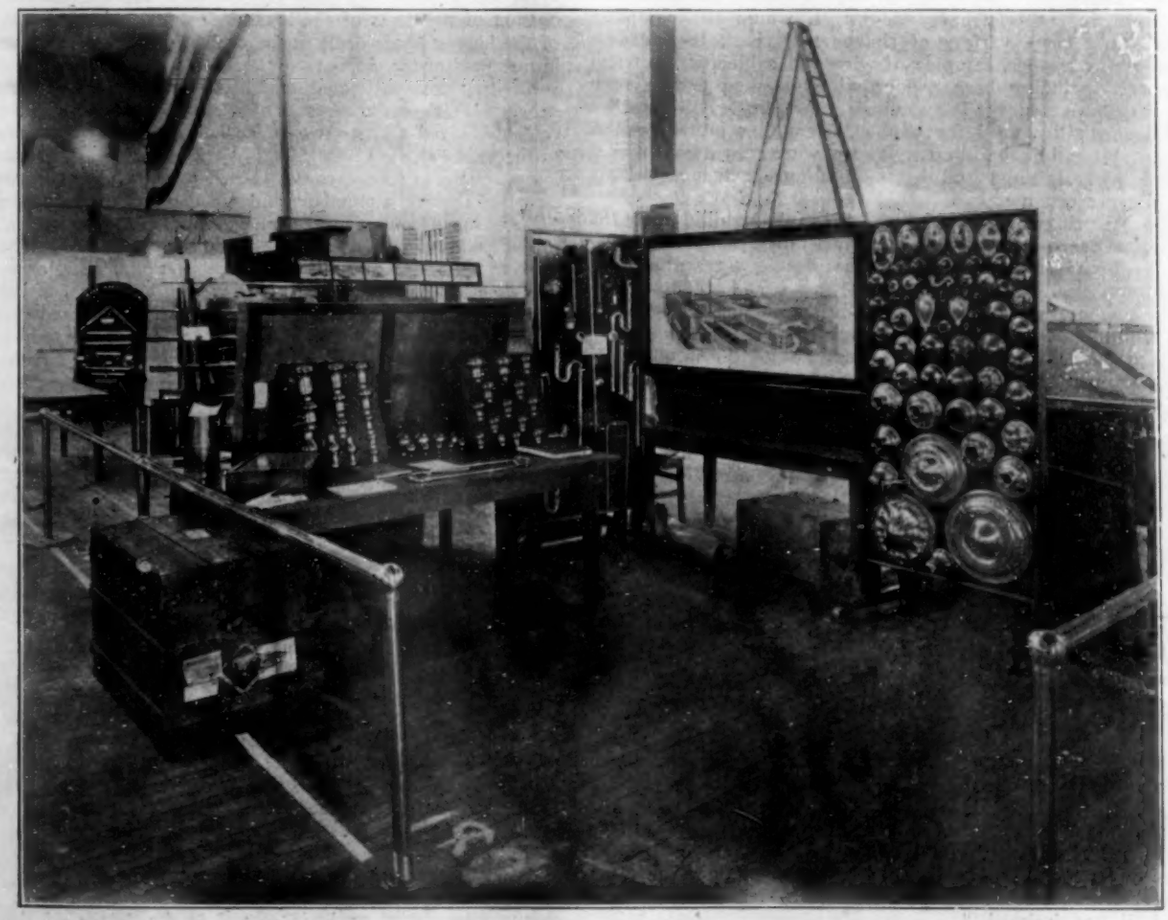
The Scovill Manufacturing Company's booth had its wartime products most attractively displayed in a handsome mahogany case. Here samples of each article were identified by a brass plate tacked underneath bearing the name and number made during the war. The peace-time manufactures, including a few new articles taken on after the war work was finished stood on tables along the front of the booth.

The figures given on the brass plates were staggering. They give a small idea of the amount of work turned out by the thousands who flooded the city during wartimes working day and night to fill important contracts. Among the figures shown in the case of samples of products produced for the United States, British and Russian governments are these: French cases, 9,563,000; British cases, 4,750,000; American cases, 936,000; time fuses (45 seconds) 775,000; United States navy combination time fuse, 200,000; anti-aircraft fuse, 1,391,000; Russian time fuse, 2,262,000; British anti-aircraft fuse 1,000,000; British time fuse, 9,267,000; Army 21 second combination, 5 250,000; Mark 5 fuse, 1,335,000; Mark 3 fuse; 3,225,000; Mark 12 fuse, 10,240.

The factory made 187,000,000 British 7 millimeter shells and 429,000,000 extrude caps (government) 13,000,000 British cartridge clips, and 4,250,000 Russian three-inch cartridge cases.

Besides these, millions of military and naval buttons for uniforms are included in wartime products.

Of the peace time products there are only a small number, probably one-eighth of the variety of articles made at the factory displayed. These include so many things that pass through the hands of the average man several times a day that they fill a Waterburian with fresh pride at the achievements of the city. The blanks of government pennies and nickels are made by the Scovill Manufacturing Company, dress buttons of every kind and shape from those that fasten a house gown to the kind that make an afternoon tea-frock fascinating are exhibited and in sharp contrast to the parts of instruments of destruction made such a short time ago, are lip stick holders and vanity boxes. Instruments of destruction, to be sure, but a milder sort of shrapnel and less painful to bear by contact. The vanity boxes, some of brass, others ornamented with enamel tops, and the lip stick holders are among the new products being made by the Scovill Manufacturing Company during the war. There are holders for Williams shaving sticks and brass boxes for the special Gillette shaving sets. The company makes all parts of a flash light except the bulb and these were examined by a great many visitors who also found it fascinating to look over the parts of automobile and bicycle lights. Other products exhibited included the parts of a Klaxon horn, phonograph tone arms, oil-cans for sewing machines, thimbles, radiator valves, hub caps, butt hinges, electric light fixtures, brass and steel screws, automatic screw machine parts, steel cups and cut gears.



A COLLECTION OF SAMPLES OF WATERBURY OUTPUT.

The evolution of a vanity box, for instance, from a lump of copper and zinc was made more comprehensive by a display which showed the processes gone through to manufacture a sheet of brass. There were two chunks of zinc and copper and then a sheet of brass as it looks after every process until a sheet four-one-thousandths of an inch thick completed the display. It was explained to visitors that even thinner sheets than this can be drawn.

The booth of the American Pin Company was identified by a huge safety pin of dimensions large enough to catch the equator together if the earth ever grows larger in the waistline. Besides the pins and hooks and eyes of all descriptions that help to make Waterbury's slogan literally true, this company had an attractive display of plumbers' brass specialties including wall brackets and domes for electric lights, electrical fixtures of various kinds, and plumbing fixtures. There were also parts of showers, trimmings for gas and electrical fixtures and brass bedstead tops.

Sections of brass tubing of all sizes from those 13 inches in diameter to others so fine that only a single thread of hair could be drawn through them were a part of the Chase Company's display. There were also sections of copper tubing, brass and copper wire and of sheet brass. The company's war-time products, which were largely condenser tubes made for the United States Shipping Board, were not displayed, the war time exhibit having been left to the Scovill Manufacturing Company. Among the sheets of brass and the metal tubing were photographs showing how the companies provide recreational facilities for their people. The pictures included views of the restaurant, rest rooms and several social groups.

The American Brass Company and the American Metal Hose Company, which is a subsidiary of the former concern, held their exhibits in the same booth. They included The American Brass Company's display, a great variety of raw materials, brass for munitions parts and tubes and parts for fuses. There were segments of drawn copper for electrical purposes, rectangular bars and strips, which the company makes in a large variety of shapes and sizes, hard drawn commutator copper, samples of wire and cable for electrical purposes, including bare copper wire, grooved trolley wire and wire bare cables. The company also displayed Benedict nickel specialties used for exposed plumbing in residences, offices and public buildings. There were parts of nickel plated brass railings and brass moldings, extruded metals and die pressed metals.

The American Metal Hose Company's exhibit included various types of metal hose, the kind most easily recognizable to the average person being that used for gas pipes and in automobiles.

The mammoth armory displayed in the manufacturing section samples of articles made in factories all over Connecticut, and the result was a maze of manufactured and unmanufactured metals destined to confuse the non-technical mind. But the brass sheets that identified Waterbury's section corner where the brass center of the world was justifying caught the visitors' eyes and drew crowds all week to the its name.

WATERBURY, CONN.

MARCH 22, 1920.

One new member, Roy T. Barnes, of Hartford, was elected to the board of directors of the Bristol Brass Corporation of Bristol, Conn., at the annual meeting held Feb. 27. Other directors re-elected were Pierce N. Welch and Harold K. English of New Haven; Dean Welch, of New York; Julian R. Holley, Samuel B. Harper, Roger S. Newell, William S. Ingraham, Albert F. Rockwell, John F. Wade, of Bristol.

Officers elected were: President, Albert F. Rockwell; vice president, H. M. Cartwell; secretary and treasurer, J. R. Holley; assistant treasurer, A. D. Wilson, all of Bristol.

The annual meeting of the stockholders of the American Silver Company was held also on February 27. The report of the directors for the year was accepted and a quarterly dividend of two per cent payable April 1 to all stockholders of the record March 31 was declared.

The following directors were re-elected: Henry F. English, Pierce N. Welch, of New Haven; Dean Welch, of New York; Julian R. Holley, Samuel N. Harper, Rogers S. Newell, Charles T. Treadway, William S. Ingraham, Albert T. Rockwell and Alexander Harper of Bristol.

Albert F. Rockwell resigned as president and Alexander Harper was elected his successor. The other officers elected were: Vice-president, Dean Welch, New York; secretary, Samuel B. Harper; treasurer, Alexander Harper. Mr. Rockwell was elected chairman of the board of directors.

The new president was general manager of the factory. He has been in the employ of the American Silver Company since 1900. He spent two years in the shop, then on the road for a few years. For six years he was in charge of the Chicago office. He was recalled in 1912 to be factory assistant and soon after was made general manager. He was elected director February 27, 1915, and became treasurer on March 26 of that year.

A liberal co-operative plan under which all employees may become stockholders in the concern has been inaugurated by the National Company. Announcement of the project was made by M. J. Byrne, president and treasurer of the National Company recently.

The plan provides that any employee who will have been with the company four months may purchase up to five shares at par $100 either for cash or on a weekly payment plan of $1 a share. This gives two years in which to complete the payment.

Stock to the value of $12,000 may be purchased by the employees under liberal conditions. In case of violation of the terms the directors reserve the right to terminate the subscriptions.

The stock of this company has paid dividends regularly at the rate of six per cent since October, 1916, and if such dividends should not be paid regularly in the future, the fault will be with the employees, says a statement issued by the company.

Leroy M. Gibbs has resigned his position as secretary of the Chamber of Commerce to become secretary of the Home Club. The latter is a semi-social organization of some of the older brass manufacturers of the city, formed for the informal discussion of problems of the brass industry. It is said that some of the biggest brass deals in the country have been consummated in meetings of the club.

Building loss estimated at $10,000 and damage to contents nearly $25,000 was the result of a spectacular fire which practically destroyed a large two and a half story wooded storehouse in the yards of the Chase Metal Works recently. Defective wiring was said to be the cause. Much machinery was in the area swept by the fire, a plumbing and supply stock and many patterns.

Local manufacturers were considerably hampered by the tie-up in the freight situation which began in the coal strike last November and continued through the severe sleet and snowstorms since. The chief troubles at present as expressed by several of the manufacutrers is the difficulty in getting manufactured products shipped out of the city. The different embargoes which have been enforced since the beginning of the winter months have succeeded in keeping these outgoing shipments at a minimum. Storage room is thus at a premium.

Some of the factories are awaiting for shipments of raw materials, though in general throughout the city the incoming shipments except from distant points have been arriving quite satisfactorily, though in small quantity.

The coal situation has been considerably relieved and the factories do not look forward to any further serious tie-up on that score.

HARTFORD, CONN.

MARCH 22, 1920.

Meeting in New Britain, Thursday, March 4, the Stanley Rule & Level Company directors received an offer of purchase from the Stanley Works, and it is understood that a majority of the directors of the rule and level company strongly favor the sale. The announcement of the offer of purchase created some surprise, as the amalgamation of the two companies will have a considerable effect on the personnel, in so far as it relates to New Britain.

Before the meeting of the directors was held, there was a joint meeting of certain directors of both companies, at which arrangements were made in regard to the details of the offer.

The proposition will be submitted soon to a meeting of the stockholders, it is understood.

The Stanley Rule & Level Company was incorporated March 25, 1854, in Connecticut. The plant manufactures rules, levels, planes, augurs and like tools. The authorized capital stock is $10,000,000, having been increased to this figure from $2,000,000 in 1917. The company's surplus is $1,281,945. The officers are: President, A. W. Stanley; vice presidents, R. N. Peck, P. B. Stanley; secretary, J. B. Wilbur, Jr.; treasurer, B. B. Bassett.

The Stanley Works was incorporated in 1852 as a Connecticut incorporation. The New Britain plant is the principal factory, and there are branches in Bridgewater and at Niles, O., and warehouses in New York City and Chicago. The company manufactures hinges, butts, cold rolled steel, etc. The capital stock is $2,500,000.

The officers are: Chairman of the board, George P. Hart; president, C. F. Bennett; vice president, W. H. Hart, 2d; secretary, E. W. Christ; treasurer, L. H. Pease.

The proposed transaction will involve about 7,000 employees, of which the Stanley Rule and Level Company employs more than 3,000 and the Stanley Works more than 4,000. The plant of the Stanley Rule & Level Company in New Britain is assessed at $2,500,000, and that of the Stanley Works in New Britain at $3,600,000.

The Farrel Foundry & Machine Company of Waterbury filed a certificate of increased capital stock in the office of the secretary of the state, this week, the increase being from $1,200,000 to $2,700,000. The increase in shares is from 12,000 to 27,000, and the 15,000 shares of additional stock will be 7 per cent cumulative preferred stock. The Farrel Foundry & Machine Company is one of the largest manufacturing concerns in the Naugatuck Valley.

Judge Thomas of the United States District Court has confirmed the appointment of Edwin N. Todd as permanent receiver of the Rowe Calk & Chain Company, of Southington, which migrated from Hartford about five years ago. It was engaged in the manufacture of anti-skid chains for autos, toe calks for horses' shoes and jacks for heavy trucks.

The transaction whereby the control of the Connecticut Power Company passed into the hands of the Hartford Electric Light Company was completed Wednesday, March 3.—W. A. L.

NEW BRITAIN, CONN.

MARCH 22, 1920.

Of outstanding interest not only to the metal manufacturing industries of New Britain, but also to others throughout the entire country is the announcement that the Stanley Works is seeking to put through a merger whereby that concern and the Stanley Rule & Level Company are to combine into one vast industry. The directors of the two concerns have already tentatively agreed and now the matter is to be put directly to the stockholders. It is said that should the proposed merger go through it will involve upwards of $8,000,000. When it is remembered that the Stanley Works, with plants in this city, Bridgewater, Mass., Hamilton, Ontario and in far off Japan, is one of the largest concerns manufacturing not only wrought steel butts and hinges and kindred articles, but also vast quantities of cold rolled and hot rolled steel, something of the importance of that plant in the industrial world may be imagined. Not only that, but also the Stanley Rule & Level Company is one of the largest, if not the largest, manufacturer of builders hardware such as planes, hammers, saws, levels, squares and all sorts of carpenters' tools, in the country. This factory makes these goods under its own name and also under various trade names and controls factories in New Britain, Newark, Bridgeport, South Shaftsbury, Vt., New Haven and Quebec, Canada.

Shares of the Stanley Rule & Level Company, under the proposed merger, would be paid in seven per cent cumulative preferred stock of the Stanley Works at a price yet to be fixed. However, it is believed that this price will be "substantially in advance of the present market value," which is 425 to 450. The personnel of the Stanley Rule & Level Company would remain practically intact, the business conducted as usual and the only change being that the two sales forces would have an opportunity to push the sale of similar lines of goods with more effect. These concerns are in no way competitive, but have a common interest. The Rule shop is capitalized at $2,000,000 with the right to increase to $10,000,000. It has been paying 20 per cent on par (100). It has about 2,000 employees on is payroll.

The Stanley Rule & Level Company had its birth away back in 1853, when T. S. North and Frederick Knapp began to make levels and plumbs. In 1857 the Stanley Rule & Level Company was organized with a $50,000 capitalization. During the last half century it has grown remarkably. In 1864 its capital was raised to $100,000 and three years later to $200,000. In 1881 another hundred thousand was added and in 1888 it was capitalized at $400,000. Business in both this concern an' the Stanley Works is flourishing.

At the North & Judd Manufacturing Company, makers of buckles and allied goods, business is rushing and it is practically impossible to keep abreast of orders. The same thing holds good at the Landers, Frary & Clark plant, which recently increased its as well as household utensils and cutlery and silverware. There is an especially heavy demand for electrical appliances and recently a new vacuum sweeper was put on the market. This has been taken off, however, to permit of some slight improvements. A large factory addition is at present under way.

Work on a new brass foundry for the P. & F. Corbin division of the American Hardware Corporation is nearing completion and business at this plant is good. There is a brisk South American trade as well as in this country, where the vast amount of building going on creates a big demand for locks, knobs, bolts, transom rods, escutcheons, window fasts and other similar hardware.

The Hart & Cooley Company and the Hart & Hutchinson Company are rushed with orders for steel lockers and the Fafnir Bearing Company, makers of steel ball bearings, are rushed to supply the trade.

All in all, conditions among the manufacturing concerns here are most favorable. There is no overabundance of labor, there is no evident labor trouble and indications point to a busy spring and summer.—H. R. J.

TORRINGTON, CONN.

MARCH 22, 1920.

Unskilled workers in metal industries in Torrington have asked for increases in pay aggregating probably 20 per cent during the past several weeks. The demands are being carefully considered by a committee consisting of representatives of the workers and the manufacturers and if a careful analysis shows that wages have not advanced in proportion to the cost of living since January 1, 1913, an advance will probably be made in order that the wages may be sufficient to cover the increased costs. While the demands for more pay were made largely by unskilled workers, the skilled workers will undoubtedly benefit by any changes that may be made in wage schedules. "Labor is unrestful. Those three words cover the situation," said a prominent local manufacturer when questioned by a METAL INDUSTRY man concerning conditions.

All kinds of building work is being delayed because of the tremendous increase in costs of materials and labor. Contemplated construction work aggregating $1,000,000 is being held up in Torrington, according to the estimate of one business man. Additions to local plants which were started during the latter part of 1919 and early part of the present year are, of course, being pushed to completion as rapidly as weather conditions and transportation delays will permit. Among these are the additions to the Standard plant and the Torrington Manufacturing Company's plant, both of which are well under way.

The severe storms during February and the early part of March have greatly hampered transportation and the factories have experienced much difficulty in getting through shipments of raw materials and in sending out completed products. This applies not only to the railroads but to motor vehicle transportation as well. The Central New England road was for several weeks almost completely tied up and as a result the factories for a time faced the possibility of a shortage of coal. Much of the coal received here is shipped by way of Harlem and over the Central New England. The fuel shortage, however, did not reach a stage to necessitate curtailment of operations.

Under the direction of the Rotary Club a poll was taken during the latter part of March among the workers in the various plants to determine sentiment on the daylight saving question. It was

proposed that in all lines of business and industry the working hours bet set forward one hour, instead of making any change in clocks and watches. Sentiment in Torrington has been strongly in favor of daylight saving.

Joseph Persechino, 24, who for several weeks secured full pay from two shops though working in only one, was fined $100 with costs and sentenced to 30 days in jail by Judge Higgins in Borough Court, on a charge of obtaining money under false pretenses. An accomplice, Pietro Vegara, who was implicated in a confession made by Persechino, was fined $25 with costs and sentenced to 30 days in jail. Persechino formerly worked at the Coe brass plant and when he quit work there Vegara continued to ring up a card for him on the time clock. Persechino, in the meantime, secured another job at the Hotchkiss Brothers plant, working under a different name. He collected his weekly pay at both shops. As a result of this incident, a time-keeper has been added to the force at the Coe brass plant.

W. T. Richardson, one of the western representatives of the electric cleaner division of the Torrington Company, reports an interesting sidelight on the rigid enforcement of prohibition in the Middle West. In Minnesota and down through the Kansas City district, Mr. Richardson has distributed great quantities of Torrington vacuum cleaners. A small son, two years old, in establishing his own vocabulary in the Richardson home at Minneapolis, had some time previously fixed the name "Boo" as a family name for the Torrington cleaners, and as the lad grew into a six-year-old and became interested in the family fortunes as reflected in the sale of cleaners, the name "Boo" stuck. An unusually successful day, with its attendant increase in the family income in the form of commissions, was frequently bulletined in a telegram to the wife and boy at Minneapolis. One of these telegrams reading "Sold $12,000 worth of Boos today" fell recently under the watchful eye of the Government drink sleuths and immediately the hotel quarters were raided in search of fire water. Richardson insists that he is a teetotaler and that the search was fruitless. He admits, however, that while the joke is mostly on the detectives, he probably will revise his list of family code words in any further telegrams.

PROVIDENCE, R. I.

MARCH 22, 1920.

Freight embargoes and tie-ups of traffic facilities because of the unusually severe weather conditions had a somewhat disastrous effect upon the metal industry in this city and state during the past month. In fact, Providence shared with New England the rigors of a severe wintry period. February was without parallel for snow and ice since 1857 and the result has been that for days at a time there was little or no movement of freight express of transportation of any kind in this section.

The most serious phase of the traffic situation was the limited supply of coal either bituminous or anthracite, which in some sections was practically entirely discontinued. Many factories were forced partially or wholly to suspend operations for varying lengths of time, which resulted in losses of many thousands of dollars. This made an additional burden to the industry, already badly handicapped and crippled through inability to obtain the requisite number of workmen to speed up the production necessary to meet the demands.

Jewelry manufacturers and the numerous co-ordinate lines have suffered inconveniences similar to others of the metal industries. But, as there has been a slight relaxation in orders, the manufacturers have been able to gain a little on the demand.

After more than a year's escape from a failure in the country amounting sufficiently to affect the trade in general, announcement was made about the middle of the month of the financial difficulties of the Margolis Jewelry Company, of Kansas City, Mo. It is understood that the total liabilities will exceed $150,000, of which about $15,000 is held by manufacturing concerns in this city and the Attleboros. This is distributed among about sixty Eastern creditors. According to the information received here, this concern executed a deed of trust some time ago and since then has been petitioned into bankruptcy. A committee of Providence creditors has been appointed to make an investigation of the affairs and conditions of the concern. Further details concerning the amount of assets and liabilities are expected soon.

The Cathedral Art Metal Company of this city, capitalized at $100,000 for the manufacture of ecclesiastical insignia, emblems and church fixtures, has been chartered by Secretary of State Parker under the laws of Rhode Island. The incorporators are William A. Peck, of East Providence; Roland L. Papin, of New York City, and Walter A. Briggs, of Attleboro, Mass.

P. S. Eddy & Son, manufacturing jewelers, 67 Friendship street, has been dissolved by mutual consent, Pembroke S. Eddy retiring, and the business will be continued under the same name by Frank P. Eddy.

The Rhode Island Legislature has granted the Gorham Manufacturing Company permission to issue 40,000 shares of capital stock at a par value of $100 each. This will increase the capital stock from $5,000,000 to $9,000,000. The increase is to be used in the retiring of certain obligations and for expansion of the business and plant. At a meeting of the directors on February 20, William A. Viall, secretary of the Brown & Sharpe Manufactuirng Company, was elected a director.

The General Electric Company has leased the plant of the D. & W. Fuse Company for a long term of years. The business will be carried on under the same name as at present and Louis W. Downes will remain as general manager.—W. H. M.

ROCHESTER, N. Y.

MARCH 22, 1920.

With the dawn of spring the prospects of improved business conditions in Rochester seem to be encouraging. Leading manufacturers speak optimistically, basing their belief that with the eventual readjustment of railroad and express shipping facilities, the manufactories can handle the tremendous demand for finished goods that is a part of the inheritance of the late war.

It is not denied that shipping facilities in and out of this city are notoriously bad, and instead of an improvement being noted, there appears to have been a trend towards worse conditions since fall. This section, of course, has undergone an unusually severe winter, which is bound to have its effect on the railroad proposition as well as other industries. Sleet and snow hamper railroads harder than any business artery known, which fact the manufacturer has discounted in advance.

With the railroads back in the hands of their real owners, an improved situation is confidently looked forward to.

Users of brass and copper are confronted with a condition that probably prevails the country over. Owing to the tremendous demand for brass, both sheets and rods, new business is accepted at the mills only at the price fixed on the day of delivery, and orders for no quantity of brass materials will be accepted except subject to a delay of two months in delivery. It is said that brass mills throughout the East are booked for months ahead with orders. Copper and spelter, of course, are affected by the brass situation. Aluminum is scarce and hard to get, owing to the intense demand. Prices, therefore, are higher, base price in Rochester being quoted at 45c.

Sargent & Greenleaf Company, makers of locks and similar instruments, will soon begin the erection of a new plant and foundry in Norton street at a cost of $165,000. This concern is a large user of metals, brass, nickel and bronze being among the chief elements.

Much speculation is being indulged in about the establishment of the General Electric Company's new plant in this city. The proposition promises to be an extensive one that will add largely to Rochester's metal-using industries. G. B. E.

DETROIT, MICH.

MARCH 22, 1920.

The winter problems that have so threatened the manufacturing industries of Detroit are about over and the indications now are for a long period of intensified industry—especially in the brass, copper and aluminum field. Scarcity of raw materials, however, still cause more or less trouble and likewise a shortage of cars, but this is not so serious as to be alarming.

The automobile industry is back of all this prosperity and so long as nothing interferes to hamper this great industry, there is nothing to fear for brass, copper and aluminum field. Most of the larger automobile companies here, and also in the suburbs, are engaged on extensive extension work. The Cadillac Motor Car Company, a subsidiary of the General Motors Corporation,

has under construction one of the largest and most modern automobile plants in the world. It is an eight building unit, with an aggregate of 2,100,000 square feet of floor space, covering 48 acres. The buildings will be four stories high, the largest 800 feet long and 600 feet wide. The heat treating building will be 500 feet long and 80 feet wide. The Du Pont Engineering Company has the constructing contract.

Construction work on the new Wills-Lee automobile plant at Marysville, a few miles out of Detroit on the St. Clair River, will begin March 1. Five buildings are to be erected, to accommodate 2,500 men. This is an entirely new concern, backed by a number of well-known automobile men, some of whom were with the Ford Motor Company.

The General Aluminum & Brass Manufacturing Company of Detroit is planning an output of 50,000 castings a day at its Port Huron, Mich., plant. Philip E. Gabriel is in charge.

The Michigan Stove Company reports an unusually heavy run of business, and although operating nearly to capacity is unable to keep up with the flood of orders. This corporation is said to have joined with the Peninsular Stove Company, the Art Stove Company, and the Baltimore Enameling Company in the construction of a large plant in Detroit for turning out enameling work. Labor shortage and transportation delays are said of late to have caused these companies considerable annoyance.

The Clayton & Lambert Manufacturing Company is reported to have purchased ten acres on the Detroit Terminal Railway between Harper and Gratiot avenues, fronting on the new Connors Road Parkway, at a cost of $100,000, on which will be erected a new modern factory plant. The buildings will have about 200,000 square feet of floor space and when completed represent an investment estimated at about $750,000.—F. J. H.

PHILADELPHIA, PA.

MARCH 22, 1920.

Metal working concerns of this city are well booked up with orders for machinery and equipment of all kinds, and the future is bright for the majority in this industry. All of the various lines are prospering, including builders of cranes, locomotives, heavy-duty stationary steam engines, street cars, machine tools and textile machinery. Philadelphia is one of the first cities to feel increased orders for general lines of mechanical equipment, and the present season sees more business ahead than any time since the close of the war.

The annual report of the Baldwin Locomotive Works, just published, shows a net profit for 1919 of $5,776,243 out of total gross sales of $84,307,776. This was the smallest gross since 1916, but was about in line with expectations, as the management was faced with the difficulty of readjusting its plants to a peace basis. In his report, Samuel M. Vauclain, president of the company, said that domestic business has been somewhat curtailed during the year, but that foreign markets have been the chief source of orders. A vigorous and aggressive foreign sales organization has been established with very satisfactory results.

The General Electric Company has asked the public works committee of Philadelphia to strike out two unopened streets from the city plan to permit the construction of a new plant on Elmwood avenue from Sixty-eighth to Seventieth streets. Purchase of the land is contingent on favorable action by the city. The company plans to build five factory buildings, each 80 by 600 feet, to cost about $5,000,000, and when completed to give employment to about 20,000 persons.

The Tabor Manufacturing Company, Eighteenth and Hamilton streets, makers of molding machines, etc., has awarded a contract for a one-story brick addition 30 by 106 feet, to cost about $18,000.

The American Manganese Bronze Company, Rhawn and Hegerman streets, is planning a one-story foundry extension 24 x 60 feet.

The Brown Instrument Company, Wayne and Windrim streets, manufacturers of pyrometers, etc., has filed plans for a two-story concrete addition 44 x 126 feet, to cost about $35,000, and a second addition of similar construction 37 x 72 feet, to cost about $22,000.

The Merchant Shipbuilding Corporation has increased its capital from $22,000,000 to $32,000,000, and has obtained a contract for the construction of two steel tankers at its local yard for the Union Oil Company, each of which has 12,000 tons rating.

The Commercial Truck Company, of Twenty-seventh and Brown streets, manufacturers of motor trucks, has filed articles of incorporation with a capital of $4,000,000.

The Ace Metal Company, 716 South Eleventh street, is planning improvements to cost about $50,000.

The U Company, Atlantic City, has been incorporated with a capital stock of $25,000 by B. G. Ulizio, Carlton Geist and W. S. Clement, for the manufacture of metal heat-treating equipment and to operate a heat-treatment plant.

The Crown Aluminum Company has been incorporated under the laws of Delaware with a capital of $300,000 to manufacture sodium, potassium, etc. The incorporators are Samuel B. Howard, Robert K. Thistle, and George V. Reilly, all of New York City, where headquarters will probably be established.

The Gomery-Schwartz Motor Car Company, 128 North Broad street, has filed plans for its new eight-story service and repair works, 160 x 450 feet, on Twenty-fourth street, to cost $1,250,000.

The Precision Grinding Wheel Company, Holmesburg, is planning a new one-story plant, 96 x 298 feet.

The Franklin Brass Foundry Company, Reading, Pa., has increased its capital to $50,000.

The Pennsylvania Pump and Compressor Company has been organized at Easton, Pa., with a capitalization of $500,000 to manufacture hydraulic pumping machinery and air compressors. A 55-acre site has been obtained for a plant, and construction is planned to begin at an early date. Among the men interested are Norman A. Messinger, works manager of the local plant of the A. S. Cameron Steam Pump Company; William E. Anderson and Ellis Nathan, chief engineer, and pump engineer of the same plant; Ward Raymond, chief engineer at the West Easton works of the Ingersoll-Rand Company; William C. Merwart, shop superintendent, and Ellis R. Snovel, purchasing agent at this plant. Resignations from the present connections have been tendered by these men.—G. B. G.

CINCINNATI, OHIO

MARCH 22, 1920.

Cincinnati and the adjoining territory continues to be a prosperous field for all concerned in the metal trades lines. Business is better than ever in this district and all prospects are for a continuance of these conditions for some time to come. Of course, there are many adverse conditions to be met, but they are being adequately taken care of to the satisfaction of all persons involved.

There are many who believe that a more stabilized market will make for better conditions, but this at present seems to be a remote possibility.

Prices in all lines continue at a high mark, with here and there increases being noted, while in some respects several lines have been more or less on a standstill for some time.

Production is away below normal, of course, due to the many conflicting circumstances that entered into the trade some time back. All interests are lending their every effort in an endeavor to boost the quantity of production, but as long as abnormal conditions continue all along the line they have little hope of making any headway.

Raw material continues to be very scarce and of course the prices are still soaring. Labor conditions are not of the best. In the metal industry, as in all other lines, there is a shortage of all class of labor, and it is becoming more difficult right along to obtain sufficient hands to keep up with the production demands.

The demand for the finished products from the plants continues in good volume and many plants report more orders on hand than can be adequately taken care of.

The trade in general is hoping for better conditions in the matter of the scarcity of materials and labor.—H. C. L.

COLUMBUS, OHIO

MARCH 22, 1920.

The metal market in Columbus and central Ohio territory has been rather quiet during the past month. The volume of business is fair, but there has been no especial buying, excepting in type metals and babbitt. Other metals have been running along

steadily without any great fluctuations in prices. The tone of the market is not very satisfactory and the future is uncertain, according to metal men.

The policy of metal using concerns is to buy only for the present and there is no disposition to stock up for the future. This fact has caused a feeling of apprehension which is difficult to explain. Shipments are coming in fairly well, when the car shortage and railroad congestion are taken into consideration.

Copper is in fair demand with no especial price variations from the previous month. Lake is selling in the neighborhood of 19¼ to 19½ cents per pound. Other grades are less. Brass is moving fairly well around 17½ to 18 cents for red and 14½ to 15 cents for yellow. Aluminum is in fair demand at the same price levels of a month ago. Tin and lead are both stronger and this is reflected on type metals. Spelter is moving well and the same is true of zinc. Taking it all in all, the market is rather quiet, although some spurts of activity are noted. The printing business is extremely active and as a result there is a strong demand for type metals of all kinds.

The Schmitt Brass Foundry Company has been incorporated in Columbus with a capital of $50,000. The concern is the incorporation of a concern at 459 Parsons avenue, which has been operated as a partnership for several years. George M. Schmitt is president and the others interested are Edward Schmitt, George W. Schmitt and Frederick Deardorf.

The Paragon Metal Products Company of Cleveland has been chartered with a capital of $500,000 by E. H. Kron, W. L. Roberts, A. W. Herdman, V. Sanderson and M. Blackman.

The Spencer Metal Products Company, of Spencer, Ohio, is preparing to erect a factory building to cost about $100,000. The work of construction will be started within a month.

The authorized capital of the Reynolds Aluminum Company, of New Washington, O., has been increased from $20,000 to $50,000.

The capital of the Cincinnati Aluminum Castings Company, of Cincinnati, has been increased from $20,000 to $75,000.

An increase in capital from $100,000 to $200,000 is announced by the Toledo Metal Products Company, of Toledo, Ohio.

The Hardening Process Aluminum & Copper Company, of Cleveland, has been incorporated with a capital of $25,000 by H. M. Buluckian, C. Bagdasarian, C. Carroll, W. E. Losch and Cyrus Locher.—J. W. L.

CLEVELAND, OHIO

MARCH 22, 1920.

Bad weather, making for poor transportation, and consequently limited receipts of raw materials in the Cleveland district, is a combination that the metal industry interests in this section have been facing for weeks, and apparently will continue to face for several weeks more. The demand for all manner of products upon which the metal industry is depended to produce continue on the increase, with the automobile crafts and allied interests the principal takers. Brass goods produced by manufacturers specializing in plumbing materials command the biggest call in that division. The most sensational advances in materials, semi-finished or finished products, that have developed since the beginning of the year has not deterred prospective builders from going ahead with their construction programs. Meanwhile insistent calls for materials from all branches of the plumbing and allied trades are heard.

Automobile and truck plants in this vicinity have not curtailed their orders, though handicapped in getting material and their finished cars to consignees. The automobile industry proper continues to operate at 90 per cent of its capacity. It is estimated that materials needed are arriving at these plants at the rate of 30 per cent below the actual need. Parts and accessories interests have been reduced from 20 per cent to 40 per cent of normal operations for lack of sufficient materials. But this is an increase in efficiency over six months ago.

Untimely conditions have not deterred new organizations from perfecting plans or present concerns from extending their operations. The Brown Body Corporation is planning to construct immediately a $350,000 plant for the production of all kinds of motor vehicle bodies. This plant will occupy six acres on the Big Four and Wheeling and Lake Erie tracks. It is expected the new plant will be in operation July 1. Meanwhile headquarters are being maintained at Superior avenue and East 32nd street.

Larger production is anticipated by the Domestic Electric Company through the acquisition of the plant buildings of the Vahan Products Company, St. Clair avenue, N. E. It is expected production will be doubled. The Domestic concern specializes in the manufacture of small electric motors for household appliances. The present plant in Cleveland is located in Whitney Power Block, and another plant is in operation at Norwalk, Ohio.

Bearings, rims, axle and springs will be made in what is claimed to be the largest establishment of its kind in the country, when plans of the amalgamation of the Eaton Axle Company and the Standard Parts Company are completed. J. O. Eaton will be president of the united companies. The capitalization of the new concern, according to banking interests back of the project, will be $35,000,000. First year's business is expected to equal $60,000,000.

The Jones Gear Company, already outgrowing its original plant, is planning the increase of capital to $1,000,000 common stock and a like amount of preferred. The increase is expected to care for the large amount of business the company is now booking.

Newest motor car industry to enter the Cleveland district is the Duesenberg Automobile and Motor Corporation, which already is planning the construction of a large plant on a five-acre tract at East 152nd street and Nickel Plate tracks. Plans call for a production of 1,500 cars the first year. The company proposes to be capitalized at $15,000,000. Officers of the company include L. M. Rankin, president of the Highland Motor Corporation, Kansas City; Newton Van Zant, president of the Revere Automobile Company, Logansport, Ind., and Fred and Otto Duesenberg, designers of the motor that bears their name.

As May 1 approaches with its hint that there must be radical advances in wages in all labor crafts, comes the announcement that the Cleveland Federation of Labor will start a campaign to organize the workers in metal industry establishments here. An effort will be made to bring 100,000 metal workers into the union. The plan, according to union officials, will include an arrangement whereby employers may make agreements with one representative for all crafts, rather than to consider agreements from several different sources.

Loss of $10,000 was sustained by the plant of the Marshall Auto Battery Company, where defective electric wiring caused an explosion. Chemicals in the plant taking fire did most of the damage.

First of a series of talks on efficient and safe management of metal working and similar industrial establishments was given before the Industrial Association of Cleveland at Hotel Olmsted by Thomas Stanion, director of safety and sanitation in the Aluminum Manufactures, Inc. These talks will occur weekly and cover a wide variety of subjects along this line.

The National Bronze and Aluminum Foundry Company is planning an addition to its plant at Kinsman Road and East 88th street. The new building is estimated to cost about $60,000, and will occupy a plot about 50 by 200 feet. Provision is being made for a railroad siding. Part of the new construction will be used for foundry purposes, and the remainder for factory production.—C. C. C.

TRENTON

MARCH 22, 1920.

The Trenton metal industries are enjoying a good season and have plenty of orders on hand. The John A. Roebling's Sons Company has taken out a permit for the erection of an addition to the plant on Clark street. The company is very busy in all the departments. The Ingersoll-Trenton Watch Company is also enlarging and is having an addition, one-story, erected to the Monmouth street plant. The contract has been awarded to Samuel Mather & Son. The company recently completed a large addition, but is still in need of room. For some time the concern conducted a department in watchmaking in a private house, where students were taught and afterwards given positions at the main plant. The house was sold and the company decided to erect a new addition.

The Westinghouse Lamp Company has adopted a new plan of insuring the 42,500 employees of the eleven plants, including the big Trenton works. The scheme of insurance is combined with a savings plan and affects the employees of the plants at New

York, Newark, Trenton, Bloomfield, Middletown, East Springfield, Philadelphia, Attica, Cleveland, Mansfield and Milwaukee.

The Katzenbach & Bullock Company, of Trenton, chemical manufacturers, has purchased the six-story and basement office and wareroom building at Washington and Desbrosses streets, New York, from the Charles F. Noyes Company. The building is occupied by the Hoffman-La Roche Chemical Works, of Basle, Switzerland, which will vacate April 15. The Katzenbach & Bullock Company will occupy the entire building.

The metal manufacturers responded liberally to the fund to build a new $500,000 Y. M. C. A. in Trenton. Karl G. Roebling and F. W. Roebling, Jr., contributed $30,000, while Colonel Washington A. Roebling gave $25,000. Karl G. Roebling also offered scholarships amounting to $250 to graduate students of the Trenton School of Industrial Arts to assist them in continuing their studies in other institutions.

The manufacturers had many employees absent during the past month because of the influenza epidemic, and some workmen are still ill. While the number of workmen ill was large the production of the plants was not seriously hampered.

Complying with the governor's fire prevention day proclamation many of the manufacturers are now holding fire drills. Speakers were sent to the plants to impress upon workers the necessity for taking every precaution against fire. The Ingersoll-Trenton Watch Company has instructed its many employees in fire drills and in case of a blaze it is probable that there would be no loss of life or excitement.

The New Jersey Court of Errors and Appeals has set aside a judgment recovered in a test case brought by Robert V. Curry against the Remington Arms-Union Metallic Cartridge Company to recover increased wages alleged to have been promised by the company in a bulletin posted in the shops. The bulletin stated that the chief of ordnance of the United States Army had authorized an increase in wages at the company's plants at Hoboken and Scranton to correspond with the scale of wages established at the plant at Bridgeport, Conn., where there had been a strike. Curry and other employees of the Hoboken plant charged that because of the bulletin they were persuaded to continue at work, though afterwards the company failed to pay the increase promised. It appeared in the case that an examiner of the Government had placed a construction upon the wage scale established at Bridgeport under which Curry and others similarly situated were excluded from the increase. Part of this testimony of the examiner was ruled out at the trial and on that ground the Supreme Court held that the judgment should be set aside. The decision affects a number of employees at the two plants.

The Perth Amboy Iron and Metal Company, of Perth Amboy, N. J., has been incorporated with $125,000 capital stock by Samuel Horowitz, Bertha Jacobson and Jacob Ruderman.

The Superior Novelty Company, of 205 Broad street, Newark, N. J., has amended its original charter and increased the capital stock to $200,000.

The Emerson Watch Case Company has leased the fourth floor of the American Transformer Building at 178 Emmett street, Newark, for the manufacture of watch cases. Frederick Portmann will be the general manager of the new factory.

The plant of the Waclark Wire Company at Elizabeth, N. J., has been sold to the American Copper Products Company, a Delaware corporation, capitalized at $14,000,000. Included in the plant is a brass mill.

The New Jersey Zinc Company announces that it will build additional zinc oxide and lithopone plants at Palmertown, Pa.

The General Alloy Company, of Newark, N. J., has let a contract for a two-story factory building to cost $20,000.

The New Brunswick, N. J., Iron and Metals Company, of 245 Remsen avenue, New Brunswick, N. J., has been incorporated with $100,000 capital stock to deal in iron and metals. The incorporators are Irving Laurie, Bessie Marcus and Joseph D. Marcus, of New Brunswick. The U Company, of Atlantic City, N. J., has been incorporated with $25,000 capital stock to treat metals by heat, etc. The incorporators are Carlton Geist, W. S. Clement and B. G. Ulizio, all of Atlantic City.

Charles H. Ingersoll, of the Ingersoll-Trenton Watch Company, and president of the Manufacturers' League of New Jersey, has sent a letter to Governor Edwards in which he says that rent profiteering can be overcome by changing the present method of municipal taxation. He says that a state income tax and business tax, which is recommended by the Tax Commission, would be shifted by manufacturers and merchants to the retail buyer through increase in prices of commodities. He asks the Governor to give careful consideration to this in his forthcoming message on taxation. Mr. Ingersoll's letter follows:

"In your proposed message on taxation, the Manufacturers' and Merchants' Taxation League asks you to give careful consideration to the fact that the present methods of raising public revenue are nothing less than fines upon housing. Besides all the natural embargoes on building, such as high cost of labor, materials and land, the builder finally faces the unnatural one of heavy municipal taxes super-imposed by the state law.

"There can be no effective move towards supplying housing demand and elimination of rent profiteering, so long as excessive cost of materials and labor, excessive land values and excessive taxes stand opposed to it. Excessive taxes and excessive land values may be corrected by removing taxes from buildings and placing them on land values, and these changes will greatly modify, if not eliminate, the remaining factor.

"The industries of the state are so menaced by taxes that they are actually moving to states where laws are saner. The state as a commonwealth is the chief sufferer. We have had investigations and commissions, both official and from important commercial bodies, and while the trend may be said to be in the right direction, it is all too slow, and lacks a guiding hand. The people of the state have been waiting a long time for an authoritative, constructive and clearcut statement on the subject of taxation and housing.

"A state income tax and business tax, which is recommended by the Tax Commission, will be shifted by the manufacturer and merchant to the retail buyer through increase in prices of commodities. The increased prices will naturally lessen demand and this will presently reduce production and throw men out of work. Wages will drop and this will still further accentuate social unrest and cultivate conditions of widespread Bolshevism."

C. A. L.

LOUISVILLE, KY.

MARCH 22, 1920.

The sheet metal working plants, especially the copper working plants are not especially busy at the present time, but the casting plants appear to be especially busy, while the plating and stamping houses are also going at a good clip. Machine shops are generally busy, and there is a heavy demand from the general run of industrial concerns for castings of various kinds.

At the present time there are fair prospects for the sheet metal houses in connection with work for soft drink manufacturers, syrup producers, etc., and soap, fatty acid and a few other similar lines are bringing in some business. However, sheet copper work as a whole is dull.

Hundreds of illicit stills have been captured in the mountains of Kentucky and Tennessee during the past few weeks, and the number in operation apparently is increasing instead of diminishing due to the big demand for liquor and high prices paid, which results in some one taking a chance. A big hardware house recently reported that it couldn't secure instantaneous gas heaters rapidly enough to supply demand, and it is a known fact that such heaters with a few changes are being converted into stills.

Demand for brass, copper and other castings is very heavy at the present time, and molders are especially scarce as there is also a heavy demand for gray iron, malleable and other substance castings, resulting in molders being fully occupied. It is alleged that demand for iron castings is so heavy that foundries cannot supply it, and that in some cases consumers are going to copper and brass castings.

The Kentucky Wagon Manufacturing Company, operating one of the largest foundries in the state, has recently purchased additional land, and plans further enlargement of its automobile departments.

The Standard Milk Machinery Company, Louisville, has filed amended articles increasing its capital from $20,000 to $40,000, naming C. Mortensen, Thomas J. Hines and Margaret Hines as signers of the amendment. The same interests control the house of Hines & Ritchey, which principally casts and does sheet metal work for the Standard Milk Machinery Company.

News was recently received from St. Bernard, O., just out of Cincinnati, of the destruction of the Elmwood Casting Company

plant by fire at a loss of $250,000, while owners of patterns who were having work done in the plant are said to have lost upward of $200,000.

The Badger Aluminum Company, Louisville, has filed amended articles increasing its capital stock from $25,000 to $50,000 and increasing its debt limit to $100,000. J. H. Parker is president.

Suit has been filed by Stratton & Terstegge Company, foundry operators of Louisville, against the Williamson Heater Company for $2,321.65, which it is alleged was paid to H. J. Haupt, former purchasing agent of the company, as a ten per cent commission on all business placed with the heater company but which was actually added to the general market value of the merchandise purchased. It was alleged that a secret contract was made which extended over a period of five years.

The Louisville Fire Brick Company, Louisville, manufacturers of brick used in big metal working operations, has had considerable trouble over car shortage and has been behind on deliveries for weeks. The P. Bannon Pipe Company, another large brick manufacturing concern, has been so busy on building materials that it hasn't been pushing fire brick at all.

Securing fuel has been a serious problem for some weeks past, as Kentucky mines are operating only half time due to car shortage and domestic demand is taking a considerable amount of such coal as is produced. Crude oil for furnaces is advancing steadily, as pipe line companies are now paying $3.75 a barrel, as against $2.60 at the wells a few weeks ago.

The Kentucky Legislature has enacted a law under which all employers of fifteen or more men on dirty work will be required to install sanitary wash rooms and lockers for employees. Another bill which has been passed by one division of the Legislature is for the purpose of placing a cent per gallon tax on gasoline for road work, with no provision made for the stationary gasoline engine operator, which will affect many machine shops.

The W. H. Cloud Molding Sand Company, Louisville, capital $5,000, has been incorporated by W. H. Cloud, L. M. Cloud and W. R. Neill. The debt limit is $5,000. The company will mine and sell molding sand.

J. W. Rademaker, of the Independent Brass Works, reports that he has closed a deal for a new plant at 1718 Cedar street which will triple the casting room capacity. The company is forty days behind on orders and badly in need of larger capacity.

Fred S. Lack, of Paducah, Ky., is developing and financing a half million dollar corporation to install a plant to manufacture multiple disc aluminum wheels for automobiles on a recent invention.

The recently incorporated United States Tin Foil Company, a $3,000,000 corporation, which will be a subsidiary of the Reynolds Corporation, Louisville and North Carolina tobacco manufacturers, has taken over the Reynolds tin foil plant at Louisville and is adding a 140 x 450 foot addition, at a cost of $125,000. Orders have been placed for rolling mills and additional motors.

MONTREAL, CANADA

MARCH 22, 1920.

Conditions among the metal working plants have shown a current of optimism owing to large orders booked by the Canada Car Company, totaling $15,000,000. The Montreal Locomotive Company, Ltd., has received an order for 45 engines from the Canadian National Railway, of which 25 are Santa Fe type, and 20 light Pacifics.

The question has been asked many times since the first of the year, when are prices going to break. A study of the metal and machinery markets week after week would lead to the conclusion that such a happening is not now seriously considered. The problem is not a matter of price. It is a question of securing the material to fill the demand.

Several of the large metal manufacturing houses in this district have stated that they could see nothing in the situation at present that hinted at any slowing up of industrial developments, and that the demand was increasing rather than decreasing.

The curtailment of imports from the United States has become the means of rectifying the exchange between Canada and the States, but there is a wide difference of opinion as to the duration of such curtailment, and as to its permanent effect. Another large American brass manufacturinig concern is to locate here, and some of the leading financial men of Montreal are on the board of directors. The company is backed by Canadian and American capital. It will be closely affiliated with the Nathan Manufacturing Company of New York. It is understood that the local plant of the Canadian Chadwick Metal Company, Ltd., will be taken over. The entire plant will be remodeled and new machinery installed at Hamilton, Ont. A general brass foundry and manufacturing business will be carried on, and the Nathan line of valves and engineering specialties will be included. The officers of the new concern are J. W. Norcross, Montreal, president; E. S. Tooth, New York, vice-presdient.; W. J. Carrigan, Montreal, managing director; R. F. Curtin, Hamilton, secretary-treasurer. Plans of the consolidated smelting and Refining Company for the extension of activities are being formed.

Business at the Angus shops of the C. P. R., looks very promising, as equipment orders to the extent of $15,000,000 are said to have been placed by the Canadian Pacific Railway. They call for freight equipment to the extent of 2,500 50-ton box-cars, 500 refrigérator, 500 automobile cars, and 24 baggage cars. The company itself will execute a considerable portion of the orders. The Canadian Car and Foundry Company, Ltd., here has secured some of the contracts, including 12 dining cars, 53 sleepers, 13 compartment cars. Before the war the C. P. R. had planned big additions to its rolling stock, but war conditions made it impossible to carry out the building program. The company is now entering upon a plan intended to meet the needs of immigration, which is expected to be enormous during the next few years.

P. W. B.

VERIFIED NEWS OF THE METAL INDUSTRY GATHERED FROM SCATTERED SOURCES

The G. & C. Foundry Company, Sandusky, Ohio, are contemplating the erection of a new core room in the spring.

The Guyan Machine Works, Logan, W. Va., will receive prices on lathes. They operate a brass and bronze foundry and a brass machine shop.

The Dawson Manufacturing Company, 4928 Broadway, Chicago, Ill., maker of automobile grease cups, has bought a one- and two-story plant, 188 x 125 ft., on Larrabee street, near Center.

The address of the **Artcraft Metal Stamping Corporation** is 1022 Myrtle avenue, Brooklyn, N. Y., instead of 1032 Myrtle avenue, which was given in these columns in the January issue.

The Lava Metal Company, Kokomo, Ind., has been incorporated with a capital of $50,000 to manufacture metal products. The company is headed by Ollie H. Buck, David C. Jenkins and Leonard B. Hodgin.

The capital stock of the **Wisconsin Aluminum Foundry Company,** Manitowoc, Wis., recently was increased from $100,000 to $200,000 and plans are being prepared for the enlargement of the company's plant.

The Regle Brass Company, Greenville, Mich., is contemplating the erection of a plant. They operate a brass foundry, brass machine shop, tool room, grinding room, casting shop, cutting up shop, plating and polishing departments.

The Mansfield Vitreous Enameling Company, Mansfield, Ohio, is made up entirely of stockholders of the Westinghouse Electric Products Company, The New Method Stove Company, and the Eclipse Stove Company, all of Mansfield, Ohio.

The J. E. Steinmeier Bronze Works, New York, N. Y., has been incorporated with a capital stock of $25,000 by L. M. and J. E. Steinmeier and E. H. Fitch, 2694 Valentine avenue, to manufacture brass and bronze products.

Robert Perlick, 194 Reed street, Milwaukee, Wisc., brass founder, has incorporated under the name of R. Perlick Brass Company, with a capital of $15,000. He operates a brass machine shop, brazing, plating, polishing and lacquering department.

Motor Trucks, Ltd., Brantford, Canada, are installing the following departments for a new line which they are about to

manufacture: tool room, grinding room, stamping, galvanizing, tinning, soldering and plating, and are interested in equipment for all of them.

The Karbo Bronze Foundries, Inc., Columbia and Bush streets, Brooklyn, has been incorporated with a capital stock of $20,000 by J. M. Plummer, N. McGlashan and C. M. Stevenson, 60 Seabring street. They will operate a bronze foundry and grinding room.

The Gordon Electric Company, Waterbury, Conn., a concern to which the Chase Metal Works rents a piece of property, is putting up an addition 30 x 40 ft., three stories high, to be used in connection with the product that the Gordon Electric Company manufactures.

The Eastman Manufacturing Company, Manitowoc, Wisc., has been organized with a capital stock of $25,000 to manufacture brass hose couplings and other brass and bronze specialties. The incorporators are J. P., C. C. and H. L. Eastman. They operate a brass machine shop.

The new plant of the **Brummeler-Ruggles Metal Products Company,** Ionia avenue and Stevens street, Grand Rapids, Mich., is nearly completed, and practically all of the machinery has been ordered, part of it being ready to install. They expect to start production about April 15.

The Barcalo Manufacturing Company, 225 Louisiana street, Buffalo, N. Y., has increased its capital stock from $300,000 to $1,000,000. They manufacture brass and steel beds, and operate a brass machine shop, tool room, grinding room, plating, polishing, japanning and lacquering departments.

The J. E. Mergott Company, 316 Jelliff avenue, Newark, N. J., manufacturer of metal products, will build a two-story addition, 42 x 60 ft., to cost $24,000. This company operates a tool room, cutting-up shop, stamping, brazing, soldering, plating, polishing and lacquering departments.

The Albrass Company, Tivoli street, Albany, N. Y., has been incorporated with $25,000 capital by E. W. Leahy, J. Erickson and F. A. W. Graham. They operate a brass, bronze and aluminum foundry, brass machine shop, tool room, grinding room, casting shop and stamping department.

The Merrick Steel Products Corporation, manufacturers of the Merrick patented plating barrel, have moved their main office and factory from Merrick, N. Y., to Rockville Centre, Long Island, where they have much larger and better facilities for building their plating and galvanizing machinery.

The Mirete Company of Massachusetts, Inc., Springfield, Mass., has been incorporated with a capital stock of $10,000, by Thomas W. Burden, George C. Raymond, Jr., and H. A. Bryant. This concern will act as the agents of the parent concern, the Mirete Company of America, New York City.

The Owren Casting Company, Attleboro, Mass., has just recently been incorporated in Massachusetts with a capital of $10,000, by E. Owren, Charles M. Robbins and Walter K. Briggs. They are open for business in bronze, German silver and aluminum castings. They do art work such as memorial tablets.

The Syracuse Metal Products Corporation, Syracuse, N. Y., has been incorporated with an active capital of $55,000 by C. P. MacArthur, A. J. Hemmer, and L. E. Doyle. They are going into a general line of sheet metal stampings, and intend doing press work on a jobbing basis. They are in need of strip steel.

The Keystone Die Casting Company, Norristown, Pa., has been chartered with a capital stock of $200,000. Incorporators are Alfred C. Rantsch, president, Victor and Herbert Mauck and Frank Sutcliffe, and E. J. W. Ragsdale, secretary. They operate an alloying foundry, tool room, and casting shop.

The White Metal Manufacturing Company, 1006 Clinton street, Hoboken, N. J., is having plans prepared for the erection of a plant to include a six-story main building, 35 x 135 ft., and two-story foundry, 20 x 80 ft. They operate a smelting and refining department, tool room, rolling mill and plating department.

The Royal Brass Foundry Company, McWhorter street and New York Ave., Newark, N. J., has been organized to manufacture brass, copper and other castings by August C. Fuchs, 304 Oliver street, and Lothar B. Elsner. They operate a brass, bronze and aluminum foundry. They are in the market for parting powder.

The Franklin Brass Foundry Company, Reading, Pa., has increased its capital from $10,000 to $50,000. They will begin to build as soon as the weather is open. They intend to double their foundry capacity and triple the machine shop capacity. They operate a brass and bronze foundry, and a brass machine shop.

The Cleveland, Ohio, office of the **Chase Metal Works** and **Chase Rolling Mill Company, of Waterbury, Conn.,** located at 310 Engineers building, is now occupied by W. B. Fairfield and C. K. Lenz. The sale of brass, bronze, copper and nickel-silver rod, wire, sheet, brazed and seamless tubing in the states of Ohio, Indiana and Michigan will be in their hands.

The Peru Brass & Manufacturing Company, Peru, Indiana, has been incorporated with a capital stock of $50,000. The directors of the company are Ernest and Oscar Theobald and John T. Knott. This concern operates a brass, bronze and aluminum foundry, brass machine shop, tool room, grinding room, plating, soldering and polishing departments.

The Coleman Lamp Company, 220 No. St. Francis avenue, Wichita, Kans., are planning to build four four-story buildings within the next few years, each to be 60 x 140 feet. Building operations are already going on. This company operates a brass machine shop, tool room, stamping, tinning, brazing, soldering, plating, polishing and lacquering departments.

The Gehnrich Indirect Heat Oven Company, Brooklyn, N. Y., has sold its present two-story and basement plant, 50 x 107 feet, at 60 Franklin avenue. They plan to concentrate manufacture at their new 125 x 200 feet, two-story works at Buckley and Skillman streets, Long Island City, which is being completed at a cost of about $100,000. They operate a tool room.

The Mansfield Sheet & Tin Plate Company, Mansfield, Ohio, at the recent annual meeting of its stockholders approved plans for the increase of the capital stock to $3,500,000. They are planning extensions, including a new open-hearth steel plant. W. H. Davey was re-elected president and treasurer, but has retired from the office of general manager, Samuel Davey, second-president, taking his place in that capacity.

The Driver-Harris Company, Harrison, N. J., are now putting up a three-story building, 52 x 100 ft., to which will be added a 100 ft. extension. The upper floor will be used as a general office, the second floor as a spooling and testing room, and the ground floor for a cleaning and shipping department. Later this year they plan to erect another large building. This company has increased its capital to $3,000,000.

The Schartow Mfg. Company, Racine, Wis., manufacturer of saddlery hardware and other metal specialties, has let the general contract to C. B. Danielson, 638 Mineral street, Milwaukee, for the construction of its new plant in South Milwaukee. It will be of brick and mill construction, one story and part basement, 91 x 310 ft. They operate japanning and tinplating plants in connection with their machine shop.

The McKenna Brass & Manufacturing Company, Pittsburgh, Pa., has acquired three pieces of property, totaling 62½ x 84 ft., on Ross street, for extensions. They expect to break ground for a six-story extension about May 1. This firm operates a brass, bronze and aluminum foundry, brass machine shop, tool room, grinding room, spinning, stamping, tinning, brazing, soldering, plating, polishing and lacquering departments.

The Burrell Technical Supply Company, Inc., Pittsburgh, Pa., has been organized to conduct a general laboratory and technical supply business. A catalog devoted entirely to apparatus for gas analysis will soon be off the press. The officers of the company are Colonel G. A. Burrell, president; J. T. Ryan, vice-president; G. H. Deike, treasurer, and G. C. Nelms, secretary. They operate a brass machine shop and grinding room.

The French "Ligue des Pilotes Aviateurs" and the **"Syndicat Professionel des Pilotes Aviateurs Français"** publish a new and very interesting aerial magazine. This journal for the diffusion and popularization of aeronautics would be pleased to inform all the foreign pilots about the formalities to go through to fly in France. Particulars and requests will be received at the offices of the Aviation Commerciale, 1, Rue Taitbout, Paris, 9°.

The Manitowoc Plating Works, Manitowoc, Wis., has increased its capital stock from $35,000 to $75,000 and will erect a solid brick factory addition, 200 x 60 ft., duplicating the present shop, built a year ago. Walter Wachowitz is president and general manager. The concern operates a tool room, grinding room, galvanizing and tinning, stamping, soldering, plating, polishing, japanning and lacquering departments.

The Joseph McGee Iron and Brass Foundry Company, 51 Sixth street, Long Island City, N. Y., and the Russell Foundry & Machine Works, at the same location, have been merged with a capital stock of $60,000. The name of the new concern is the McGee-Russell Founders and Machinists Company. J. M. and F. Russell and M. M. Storm head the company. They operate a brass, bronze and aluminum foundry, brass machine shop and casting shop.

The Waukesha Foundry Company, Waukesha, Wisc., will erect a new plant which will be equipped for producing brass and bronze castings, mainly for the automotive industries. They have purchased a site from the Federal Bridge and Structural Company, 170 x 300 ft., for a brick and steel building, 50 x 200 ft., costing about $45,000 with equipment. At present they require the following equipment: metal reclaiming machinery, flasks and overhead trolley systems.

The Oregon Brass Works, Second and Everett streets, Portland, Ore., have awarded the contract for two electric furnaces, one of 1,000 lbs. capacity and one of 2,000 lbs. capacity to the Detroit Electric Furnace Co., Detroit, Mich., the installed cost of which will be approximately $25,000. This concern operates a smelting and refining department, brass, bronze and aluminum foundry, a brass machine shop, stamping, plating, polishing and lacquering departments.

The Universal Metal Spinning and Stamping Company, Inc., has purchased the building at 718-28 Atlantic avenue, Brooklyn, N. Y., which comprises about 80,000 square feet, at a price close to a quarter of a million dollars. The building has been suitably remodeled for the convenience of their line of production. Among the various new departments installed they are equipping a high class polishing and plating plant which will enable them to turn out a finished product.

The General Platers' Supply Company, Inc., announce that for the convenience of the local trade they have established a retail department at 489 Broome street, New York, in charge of Mr. Blackstone. Local trade in New York, Brooklyn, and nearby Jersey is invited to call for small requirements or whenever they are in a hurry for any polishing or plating supplies. They will find a stock of polishing wheels, polishing compositions, brushes and chemicals used in electroplating.

The Wisconsin Die Casting Company, Milwaukee, Wis., sustained a loss by fire in its plant at Hubbard street and Reservoir Avenue on January 28th. Repairs and replacements were made immediately. A. Gustave R. Hintz is president. At the present time they are confining their efforts principally to die cast metal alloys in the production of die castings only. They have added a modern and efficient tool department for high class die and tool production.

The Tilley Brass Manufacturing Company, Inc., Los Angeles, Cal., manufacturer of brass, bronze, and aluminum castings has moved into larger quarters at 3420 South Main street. By the 1st of April, they will be in larger buildings on 3209 Boaz street, where they shall increase their working capacity to twice its present size. They will be able to take care of any kind of brass, bronze or aluminum job. They operate a brass, bronze and aluminum foundry, brass machine shop, plating and polishing departments.

The W. A. Mills Brass Company, Port Chester, N. Y., recently was reorganized with an active capital of $150,000. They manufacture a general line of plumber's supplies, such as floor flanges, brass ferrules, solder nipples, lavatory traps, etc., and also do considerable jobbing work. At present they are running to full capacity. They operate about ten moulding machines in addition to tub and bench moulders, and use pit furnaces, gas furnaces and oil furnaces. They are now installing a Booth Electric furnace, which they expect to have in operation in about one month. They operate a brass, bronze and aluminum foundry, brass machine shop, grinding room and casting shop.

The Norton Company, Worcester, Mass., is preparing plans for an addition to its machinery division, formerly conducted as the Norton Grinding Company, to consist of a six-story steel and cement building, 75 x 150 feet, to give 67,500 sq. ft. of new floor space. The immediate purpose of the structure is to house the pattern shop, carpenter shop and cooper shop, and to give space for the storage of finished parts and finished machines. Later on, as the machinery division needs more room, the building will be given over to that purpose. The Worcester plant of the Norton Company now has 30 acres of floor space, of which seven acres are occupied in building grinding machines. The addition will give another acre and a half.

The Rome Wire Company, Rome, N. Y., manufacturer of bare and insulated electrical wires, which recently increased its capital from $1,500,000 to $10,000,000, has purchased the copper wire-drawing and rubber insulating departments of the B. F. Goodrich Company, Akron, Ohio, and intends to move them to its new plant at Buffalo, formerly the Carrick Works. The Buffalo branch will manufacture for its own consumption, bare copper wire from which it will manufacture rubber covered wires and cables, particularly for use in the automobile trade. H. T. Dyett is president. They have let contract to the John W. Cowper Company, Buffalo, for additions, totaling 60,000 sq. ft. floor space to their recently acquired plant at Clyde avenue and the Lackawanna Railroad, Buffalo. They operate a bronze and copper casting shop, and copper rod rolling mill.

The Alliance Brass & Bronze Company's plant at Alliance, Ohio, was damaged by fire, two-thirds of the main foundry burned out, the furnace room a total wreck, and everything in the core room wrecked except the ovens. Within four days they were pouring heats from the pit furnaces without a roof on that part of the building, and in one week from the date of the fire were going ahead full steam, but with no sides nor roof. Two weeks after the fire, the last man had finished his work, the building was complete and all machinery running. The melting equipment consists of three large Simplex furnaces, two oil fired crucible furnaces and seven pit furnaces. All units are motor driven, each independent of the other, which includes oil pump, blowers, sand machine, core and cutting off machines.

The American Metallurgical Corporation, Franklin Trust Building, Philadelphia, Pa., announce the opening of an office at Credland Chambers, 111 Queen street, Sheffield, England. The title of the headquarters there to be the Midland Metallurgical, Ltd. The foreign headquarters will be under the direction of Beecroft and Partners, an old and well known engineering organization of Staffordshire, England. Mr. G. C. Castle to be directly in charge. They also announce the receipt of a contract from the United States Asbestos Company, Lancaster, Pa., with works at Manheim, Pa., for the designing and installation of an automatic electric vulcanizing equipment. All of the heating elements used in this construction will be of the General Electric type, the oven body will be of the Young Brothers type manufactured at Detroit.

The National Anode Company, Inc., are now in their new and enlarged plant at Delawanna, N. J. Their plans call for an up-to-date rolling mill for the manufacture of rolled anodes in addition to the Moldode anodes. While they are confined at present to the manufacture of anodes they are building larger buildings and installing equipment for the manufacture of another line of copper products which they hope to announce at a very early date. All their melting is done in the open flame oil burning furnaces of the W. S. Rockwell type, and the results are very satisfactory. They are drilling a very deep Artesian well and building their own power plant to generate 500 h. p. In the meantime their power is being supplied by Public Service. They have their own laboratory staff with all modern testing apparatus and also a plating room where all problems of the platers in regard to anodes are solved.

GENERAL ELECTRIC LEASES REMINGTON

The great munition plant that the Remington Arms U. M. C. Company constructed at Bridgeport during the war has been taken over under lease by the General Electric Company, with the option to purchase, Joseph P. Day, who engineered the transaction, announced recently. More than $7,000,000 was involved.

The factory is probably the largest of its kind in the country. It was built purely for the filling of war orders, and the normal work of the Remington Company will be carried on in its long-established Bridgeport plant.

Covering a tract of about forty acres, the General Electric Company's new structure affords actual floor area of 1,555,257 square feet. When in full operation it will employ several thousand workers.

C. L. Reierson, president of the Remington Arms Company, said: "The plant that has just been taken over by the General Electric Company was one of our surplus properties. The leasing of this property has no effect whatsoever on our U. M. C. Company plant at Bridgeport."

TRADE PUBLICATIONS

Transportation Act—A booklet issued by the Guarantee Trust Company, of New York, on the bill passed in Congress returning the railroads to their owners.

Federal Railroad Act of 1920—A booklet issued by the Mechanics and Metals National Bank, of New York, on the Federal Railroad Act of 1920, giving the text of the act with an analysis and index.

Aluminium Facts and Figures—A loose-leaf booklet attractively bound, issued by the British Aluminium Company, Ltd., of London E. C., England, giving a great deal of interesting and valuable information on aluminum ingots, billets, round rod, wire, strand, paper-lead cables, fuse wire, terminals, connectors, tappings, bar and strip, sheet, tubes and cross-sections of various kinds.

Forced Draft—A live, wide-awake little publication of the employees of the George A. Fuller Company, Carolina Shipyard, Wilmington, N. C.

Heat Treating Furnaces—Bulletins No. 209, 211, 212, and 213, issued by W. S. Rockwell Co., New York City, showing hardening, tempering, forging, spring, reheating and saw hardening furnaces.

Metallurgical Service—A folder issued by the New York Testing Laboratories, New York City, giving some information about their organization, personnel, purpose, activities and types of work done.

Blast Gates—Bulletin No. 210, issued by the W. S. Rockwell Company, New York City, which deals with air tight blast gates, for use with air piping which ranges from two to fourteen inches in diameter.

Calendar—A loose-leaf calendar issued by the Joseph Dixon Crucible Company, Jersey City, N. J., unusually well illustrated, with removable sheets which cover the years 1920, 1921 and 1922. The back is permanent so that the calendar may be renewed by attaching additional sheets which the Joseph Dixon Crucible Company will be glad to supply.

METAL STOCK MARKET QUOTATIONS

	Par.	Bid.	Asked.
Aluminum Company of America	$100	$525	$575-650
American Brass	100	220	210-215
American Hardware Corp	100	157	135-145
Bristol Brass	25	34	27-33
International Silver, com	100	30	35-45
International Silver, pfd	100	92	97-101
New Jersey Zinc	100	240	294-298
Rome Brass & Copper	100	280	300-325
Scovill Mfg. Co.	100	400	440-460
Yale & Towne Mfg. Co.	...	250	260-270

Corrected by J. K. Rice, Jr., & Co., 26 Wall Street, New York.

METAL MARKET REVIEW

WRITTEN FOR THE METAL INDUSTRY BY W. T. PARTRIDGE.

COPPER.

While producers' bookings in February were under, rather than in excess of 125,000,000 pounds, including 30,000,000 pounds for export, bookings in first half of March were at even a less rate, probably not aggregating as much as 50,000,000 pounds for both domestic and foreign consumption. Producers' prices during latter half of February declined about ½c. per pound to 19c. delivered, for prompt to June inclusive electrolytic copper, while outside prices were off ¼c. to 18.50-18.75c. During first half of March, with only light demand from either home consumers or from foreign buyers, the recession was continued gradually, until on March 19, prompt deliveries were held at 18.50-18.75c. for prime lake, at 18.18-18.75c. for electrolytic, and at 17⅞c. for casting copper. April deliveries, electrolytic, were 18.37½c., and second, third and fourth quarters were each ½c. per pound advance. Producers' prices, on the same day, were 18.25-18.50c. delivered, for prompt to third quarter positions electrolytic.

Late reports are that large producers dropped the price of electrolytic copper to 18c. delivered for shipment over the next few months and thereby secured some large contracts from domestic consumers. Some producers are said to have sold more than the amount of their output in March, which will result in reduction of surplus stocks. The market again is firmer at 18¼c. to 18½c. delivered. In the outside market March position is firm at 18c. and April at 18¼c. f. o. b. refinery.

Continued flagrant manipulation of the tin market abroad, in February, carried prices there, to new maximum levels and while prices here were necessarily affected sympathetically, the advance was not so great proportionately. Prices at the end of February were 2.50c. above prices quoted February 13 to 61c. for spot Straits and Banca, 60.75c. for American pure and 60.25c. for 99% tin. Early in March, the advance was continued to 63.50c. for Straits and Banca; thereafter, fluctuating within a range of 4.00c. per pound, the peak price being 64.00c. reached on March 11. Fluctuations were partly due to rapidly changing Sterling exchange rates during this period. On March 15, there was a reaction of 1¾c. per pound, Straits becoming available at 62c. No Banca was offered, but American pure could be purchased at 62.25c. and 99% tin at 61.25c. per pound. With abundant stocks on hand available to cover all consumers' requirements, and with sufficient metal arriving and afloat to meet future needs for several months, sentiment in this country did not respond to methods pursued abroad in an effort to establish higher prices.

LEAD.

Because of continued stringency in supplies, due in part to transportation difficulties, combined with active consuming demand, the lead market in the latter half of February remained strong at advancing prices. Increasing interest in future positions was shown by buyers, who, knowing conditions at mines and smelters, were not favorable for production sufficient to meet demands, became anxious to cover for future needs. The leading interest advanced prices ¼c. per pound on Feb. 19, and again on Feb. 24, the outside market upon each occasion, advancing ⅛ to ¼c. Closing February, outside prices were 9.00c. East St. Louis, 9.25c. New York, being ¼c. premium over producers' figures. At the beginning of March, outside prices continued to rise, conditions of supply and demand being unchanged. On March 5, both markets were again advanced, the American Smelting & Refining Co., to 9.00c. East St. Louis, 9.25c. New York, while the outside market was up to 9.00-9.10c. East St. Louis, 9.50c. New York. During the next few days, while New York supplies continued scarce, there were easier conditions noted regarding offerings in the West. On March 15, however, these figures were slightly advanced for prompt and nearby, and April to May position was available at 8.95-9.05c. East St. Louis. At New York prices were 9½c. for prompt, 9¾ for April and 9.30-9.40 for May shipment.

ZINC.

The spelter market in latter half of February remained inert, until more favorable exchange rates by Feb. 18 made export sales again possible, prices here, recovering in a few days all of the previous decline of the month. Further weakness in exchange, however, soon developed and February closed with a net decline in prices of ¼c., at 8.75c. East St. Louis, 9.80c. New York. These prices remained firm until March 3, when a further decline in London prices and the continued weakness in exchange caused a decline here of 10 points. This was recovered two days later upon the rise in sterling, and by March 10, East St. Louis was up to 8.80-8.90c. and New York to 9.15-9.25c. for prompt, March and second quarter, the whole situation depending upon price fluctuations in London and in sterling exchange. On March 15 the market was easier at 8.65-8.75 East St. Louis and 9.00-9.10c. New York for prompt, March and April quoted shipment.

ALUMINUM

Some weakness developed in the open aluminum market during third week of February, due to plentiful supplies and light demand, which resulted in a decline of ½c. per pound, carrying prices to 31-32c. for virgin ingots 98-99% pure and to 30.50-31.50c. for remelted 98-99%. No. 12 remelted and sheet 18ga and heavier, however, were unaffected by the decline, and on Feb. 19, there was a recovery on virgin to 31.50-32c. With continued arrivals of supplies, prices for ingots again reacted ½c. on March 1, there being no further change at time of going to press, when virgin was held at 31-32c., remelted 98-99% at 30.50-31.50c. and No. 12 remelted at 29-30c. The Aluminum Company of America throughout the entire period held virgin ingots at 33c., No. 12, remelted at 31.50c., but on March 1, advanced sheet 18ga and heavier 2c. per pound to 44.20c. The prospect is for higher prices in the open market also.

ANTIMONY.

While the volume of business transacted in the latter half of February was not so large as during the previous weeks, prices were maintained unchanged at 11.62½c. duty paid for wholesale and at 11.75-11.87½c. for jobbing lots until March 3, when a decline began, due to increasing supplies made available by resales, which was continued at intervals until on March 15, prices for prompt were off ⅛c. per pound to 11.00c. duty paid for spot carloads and 11.25c. for jobbing lots, the market being quiet.

SILVER.

The general trend of fluctuations in prices of bar silver in the latter half of February, and first half of March continued downward with a gradual decline that carried from $1.32 per ounce on Feb. 13, to $1.17½ on March 15, making a total decline of 15 points; recovered to $1.24 on March 18.

QUICKSILVER.

Prices of quicksilver in the latter half of February recovered $10 per flask, from $80 to $90 on Feb. 26, declining on March 1 to $87, on March 8 to $86, but by March 10 were up to $89 per flask of 75 pounds. Later the price advanced to $93.

PLATINUM.

The price of platinum was firmly maintained at $155 per ounce during all of February and up to March 12, when a reaction of $20 per ounce to $135 occurred. The decline was attributed to the probability of Russian supplies again becoming available in this market. Later the market recovered to $142.

OLD METALS.

Old metals market, after drifting during last fortnight in February, showed some improvement early in March, but almost immediately the shading of copper prices in the major market was reflected by more or less depression in the trade, where demand seemed confined to composition turnings, scrap lead and type scrap. On March 12, the only advances noted since last report were ½c. on tea lead and heavy lead to 6c. and 7.75c. respectively; 1c. on No. 1 pewter to 39c. and 2c. on block tin pipe to 52c. and ¼c. each on new zinc scrap and electro type scrap. Other items were off ¼ to ½c. per pound, strictly crucible copper to 16.50c., uncrucibled copper wire to 15.75c., heavy brass to 9.50c. Aluminums were down to 25.50c. for clippings, to 23c. each for old cast and for old sheet.

WATERBURY AVERAGE

Lake Copper. Average for 1919, 19.55. 1920—January, 19.25. February, 19.125.

Brass Mill Zinc. Average for 1919, 8. 1920—January, 9.75 February, 9.40.

FEBRUARY MOVEMENTS IN METALS

Copper:	Highest.	Lowest.	Average.
Lake	19.25	19.00	19.09
Electrolytic	19.00	18.50	18.611
Casting	18.62½	18.00	18.215
Tin	64.25	57.00	60.00
Lead	9.25	8.75	8.954
Zinc (brass special)	9.35	8.95	9.169
Antimony	11.62½	11.00	11.555
Aluminum	33.00	32.00	32.50
Quicksilver (per flask)	$90.00	$80.00	$83.333
Silver (cts. per oz.)	134½	129	131.29

INQUIRIES AND OPPORTUNITIES

Under the directory of "Trade Wants" (published each month in the rear advertising pages), will be found a number of inquiries and opportunities, which, if followed up, are a means of securing business. Our "Trade Want Directory" fills wants of all kinds, assists in the buying and selling of metal, machinery, foundry and platers' supplies, procures positions and secures capable assistants. See Want Ad. page.

Metal Prices, March 22, 1920

NEW METALS

	Cents.
COPPER—DUTY FREE. PLATE, BAR, INGOT AND OLD COPPER.	
Manufactured 5 per centum.	
Electrolytic, carload lots	18.00-18.25
Lake, carload lots	18.50
Casting, carload lots	17.75
TIN—Duty Free.	
Straits or Australian, carload lots	61.75-62.00
LEAD—Duty Pig, Bars and Old, 25%; pipe and sheets, 20%. Pig lead, carload lots	9.00-9.25
ZINC—Duty 15%.	
Brass Special	9.25
Prime Western, carload lots	9.10
ALUMINUM—Duty Crude, 2c. per lb. Plates, sheets, bars and rods, 3½c. per lb.	
Small lots, f. o. b. factory	....
100-lb. f. o. b. factory	....
Ton lots, f. o. b. factory	31-33
ANTIMONY—Duty 10%.	
Cookson's, Hallet's or American	Nominal
Chinese, Japanese, Wah Chang WCC, brand spot	11.65
NICKEL—Duty Ingot, 10%. Sheet, strip, strip and wire, 20% ad valorem.	
Ingot	43.00
Shot	43.00
ELECTROLYTIC	45.00
MANGANESE METAL	Nominal
MAGNESIUM METAL—Duty 20% ad valorem (100 lb. lots)	$1.85
BISMUTH—Duty free	Nominal $2.65
CADMIUM—Duty free	Nominal $1.40
CHROMIUM METAL—Duty free	Nominal
COBALT—97% pure	$2.50-$3.00
QUICKSILVER—Duty 10% per flask of 75 pounds	$93.00
PLATINUM—Duty free, per ounce	$142.00
SILVER—Government assay—Duty free, per ounce	$1.24
GOLD—Duty free, per ounce	$20.67

Metal Prices, March 22, 1920

INGOT METALS

Silicon Copper, 10%	according	to	quantity	49	to55
Silicon Copper, 20%	"	"	"	36	to40
Phosphor Copper, guaranteed 15%	"	"	"	32	to40
Phosphor Copper, guaranteed 10%	"	"	"	29	to36
Manganese Copper, 30%	"	"	"	65	to72
Phosphor Tin, guarantee 5%	"	"	"	75	to78
Phosphor Tin, no guarantee	"	"	"	74	to79
Brass Ingot, Yellow	"	"	"	14½	to16½
Brass Ingot, Red	"	"	"	20	to22
Bronze Ingot	"	"	"	22	to24
Parsons Manganese Bronze Ingots	"	"	"	22½	to24
Manganese Bronze Castings	"	"	"	32	to42
Manganese Bronze Ingots	"	"	"	19	to23
Manganese Bronze Forgings	"	"	"	30	to40
Phosphor Bronze	"	"	"	24	to30
Casting Aluminum Alloys	"	"	"	32	to34

OLD METALS

Buying Prices.		Selling Prices.
16½to17½	Heavy Cut Copper	18 to18½
16 to16½	Copper Wire	17½to18
14½to15	Light Copper	16½to17
16 to16½	Heavy Machine Comp.	17½to18
11½to12	Heavy Brass	12½to13
9 to 9½	Light Brass	10½to11
9 to 9½	No. 1 Yellow Brass Turnings	11 to11½
14 to14½	No. 1 Comp. Turnings	16 to16½
4.25	Heavy Lead	4.90
4.25	Zinc Scrap	5.00
10 to13	Scrap Aluminum Turnings	11 to14
21 to23	Scrap Aluminum, cast alloyed	23.50to25
24.00	Scrap Aluminum, sheet (new)	26.50
36.00	No. 1 Pewter	40.00
18.00	Old Nickel anodes	20.00
26 to28	Old Nickel	30 to32

BRASS MATERIAL—MILL SHIPMENTS

In effect January 7, 1920.

To customers who buy 5,000 lbs. or more in one order.

	Net base per lb.		
	High Brass.	Low Brass.	Bronze.
Sheet	$0.25¼	$0.27¼	$0.29
Wire	.25¼	.27¼	.29
Rod	.23¾	.28	.30
Brazed tubing	.37	..	.41¾
Open seam tubing	.37	..	.41¾
Angles and channels	.38	..	.42¾

To customers who buy less than 5,000 lbs. in one order.

	Net base per lb.		
	High Brass.	Low Brass.	Bronze.
Sheet	$0.26½	$0.28½	$0.30¼
Wire	.26½	.28½	.30¼
Rod	.25	.29¼	.31¼
Brazed tubing	.38¼	..	.43
Open seam tubing	.38¼	..	.43
Angles and channels	.39¼	..	.44

SEAMLESS TUBING

Brass, 30½c. to 32½c. per lb. base.
Copper, 32c. to 34c. per lb. base.

TOBIN BRONZE AND MUNTZ METAL

Tobin Bronze Rod	29½c. net base
Muntz or Yellow Metal Sheating (14"x48")	25¾c. " "
Muntz or Yellow Rectangular Sheets other than Sheathing	26¾c. " "
Muntz or Yellow Metal Rod	23¾c. " "

Above are for 100 lbs. or more in one order.

COPPER SHEET

Mill shipments (hot rolled)	29½c. net base
From stock	31½c. " "

BARE COPPER WIRE—CARLOAD LOTS

22¾c. to 23¼c. per lb. base.

SOLDERING COPPERS

300 lbs. and over in one order	31½c. per lb. base
100 lbs. to 300 lbs. in one order	32½c. " " "

ZINC SHEET

Duty, sheet, 15%. Cents per lb.

Carload lots, standard sizes and gauges, at mill, 12½c. basis, less 8 per cent.

Casks, jobbers' prices	14c.
Open casks, jobbers' prices	14½c.

ALUMINUM SHEET AND ROD

Sheet Aluminum, base price, 52c. per lb. Coils 48c. per lb.

ROD.

B. & S. Gauge.

¼" to 1" Advancing by 32nds
1" to 5/16" " " 16ths } 98% rolled, 43.10 cents per lb.
2 5/16" to 3½" " " 8ths

5/16" to ¼", 98% rolled and drawn.....48.80 cents per lb

BLOCK TIN SHEET AND BRITANNIA METAL

Block Tin Sheet—18" wide or less. No. 26 B. & S. Gauge or thicker, 100 lbs. or more, 10c. over Pig Tin. 40 to 100 lbs., 15c., over 25 to 50 lbs., 17c. over, less than 25 lbs., 25c. over.

No. 1 Britannia—18" wide or less. No. 26 B. & S. Gauge or thicker, 500 lbs. or over, 2c. over N. Y. tin price, 100 lbs. or more, 5c. over Pig Tin. 50 to 100 lbs., 12c. over, 25 to 50 lbs., 15c. over, less than 25 lbs., 25c. over.

Above prices f. o. b. mill.

Prices on wider or thinner metal on request.

LEAD FOIL

Base price—figured on base price of lead at the time.

PLATERS' METALS

Platers' metal, so called, is very thin metal not made by the larger mills and for which prices are quoted on application to the manufacturer.

SILVER SHEET

Rolled silver anodes .999 fine are quoted at from $1.25 to $1.27 per Troy ounce, depending upon quantity.

Rolled sterling silver, $1.18 to $1.21.

NICKEL ANODES

85 to 87% purity	.55c.	per lb.
90 to 92% "	.57½c.	per lb.
95 to 97% "	.60c.	per lb.

Supply Prices, March 22, 1920

CHEMICALS

Acid—		
Boric (Boracic) Crystals	lb.	.25
Hydrochloric (Muriatic) Tech., 20 deg., Carboys	lb.	.04
Hydrochloric, C. P., 20 deg., Carboys	lb.	.10
Hydrofluoric, 30%	lb.	.40
Nitric, 36 deg. Carboys	100 lb.	7.28
Nitric, 42 deg., Carboys	100 lb.	7.90
Sulphuric, 66 deg., Carboys	lb.	.03½
Alcohol—		
Denatured	gal.	1.10
Alum—		
Lump, Barrels	lb.	.05½
Powdered, Barrels	lb.	07.
Aluminum sulphate, commercial tech	lb.	.15
Aluminum chloride solution	lb.	.16
Ammonium—		
Sulphate, tech., Barrels	lb.	.07
Sulphocyanide	lb.	—
Argols, white, see Cream of Tartar	lb.	.80
Arsenic, white, Kegs	lb.	.15
Asphaltum	lb.	.35
Benzol, pure	gal.	.65
Blue Vitriol, see Copper Sulphate.		
Borax Crystals (Sodium Biborate), Barrels	lb.	.10½
Calcium Carbonate (Precipitated Chalk)	lb.	.15
Carbon Bisulphide, Drums	lb.	.08
Chrome Green	lb.	—
Cobalt Chloride	lb.	2.00
Copper—		
Acetate	lb.	.60
Carbonate, Barrels	lb.	.29
Cyanide	lb.	.65
Sulphate, Barrels	lb.	.09
Copperas (Iron Sulphate, bbl.)	lb.	.04
Corrosive Sublimate, see Mercury Bichloride.		
Cream of Tartar, Crystals (Potassium bitartrate)	lb.	.80
Crocus	lb.	.15
Dextrin	lb.	.25
Emery Flour	lb.	.10
Flint, powdered	ton	—
Fluor-spar (Calcic fluoride)	ton	—
Fusel Oil	gal.	5.50
Gold Chloride	oz.	14.00
Gum—		
Sandarac	lb.	—
Shellac	lb.	—
Iron, Sulphate, see Copperas, bbl	lb.	.04
Lead Acetate (Sugar of Lead)	lb.	.25
Yellow Oxide (Litharge)	lb.	.20
Mercury Bichloride (Corrosive Sublimate)	lb.	1.92
Nickel—		
Carbonate Dry	lb.	.80
Chloride, 100 lb lots	lb.	.55
Salts, single, bbl	lb.	.17
Salts, double, bbl	lb.	.15
Paraffin	lb.	.25
Phosphorus—Duty free, according to quality		40-45
Potash, Caustic, Electrolytic 88-92%, fused	lb.	.32
Electrolytic 70-75%, fused	lb.	.26
Potassium Bichromate, Casks	lb.	.40
Carbonate, 80-85%	lb.	.25
Cyanide, 98-99½%, 100 lb. cases	lb.	.18
Pumice, ground, bbls	lb.	.05
Quartz, powdered	ton	—
Official	oz.	—
Rosin, bbls.	lb.	.08½
Rouge, nickel, 100 lb. lots	lb.	.40
Silver and Gold	lb.	.60
Sal Ammoniac (Ammonium Chloride)	lb.	.18
Sal Soda	lb.	—
Silver Chloride, dry	oz.	1.43
Cyanide	oz.	—
Nitrate, 100 ounce lots	oz.	1.00
Soda Ash, 58%, bbls.	lb.	.02½
Sodium—		
Biborate, see Borax, bbls	lb.	.10½
Bisulphite, tech.	lb.	.07
Cyanide, 96 to 98%	lb.	.25
Hydrate (Caustic Soda)	lb.	.15
Hyposulphite, 100 lb. lots	lb.	.03¾
Nitrate, tech., bags	lb.	.06
Phosphate	lb.	.05
Silicate (Water Glass) bbls	lb.	.03
Sulpho Cyanide	lb.	.90
Soot, Calcined	lb.	—
Sugar of Lead, see Lead Acetate	lb.	.25
Sulphur (Brimstone) bbls.	lb.	.03
Tin, Chloride	lb.	.65
Tripoli Composition	lb.	.02½
Verdigris, see Copper Acetate	lb.	.60
Water Glass, see Sodium Silicate, bbls	lb.	.03
Wax—		
Bees, white ref. bleached	lb.	—
Yellow	lb.	.60
Whiting	lb.	.05
Zinc., Carbonate, bbls.	lb.	.24
Chloride, 600 lb lots	lb.	.15
Cyanide	lb.	.45
Sulphate, 100 lb cases	lb.	.05

COTTON BUFFS

Open buffs, per 100 sections (nominal).		
12 inch, 20 ply, 64/68, cloth	base,	$95.05
14 " 20 " 64/68, "	"	118.85
12 " 20 " 84/92, "	"	136.05
14 " 20 " 84/92, "	"	183.30
Sewed buffs, per pound		
Bleached and unbleached	"	.90

FELT WHEELS

			Price Per Lb.
White Spanish—			
Diameter— 6" to over 16"	Thickness—½" and ¾"		$4.00
" 6" and 8"	" 1" to 3"		3.35
" 10" to 16"	" 1" to 3"		3.25
" over 16"	" 1" to 3"		3.35
" 6" to over 16"	" over 3"		3.40
Grey Mexican—			
Diameter— 6" to over 16"	Thickness—½" and ¾"		$3.90
" 6" and 8"	" 1" to 3"		3.25
" 10" to 16"	" 1" to 3"		3.15
" over 16"	" 1" to 3"		3.25
" 6" to over 16"	" over 3"		3.30

Above are even diameters, Odd diameters 50c advance.